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A ROUND-THE-WORLD BOTANICAL EXCURSION

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IN August, 1911, it was my good fortune to start on an extensive botanical expedition under the auspices of the University of Chicago. The principal places visited included the Sandwich Islands, Fiji Islands, New Zealand, Australia, South Africa and Teneriffe, from which place the return to Chicago was by way of London and New York. The trip was unique in that I went entirely alone and for the purpose of making a strictly scientific investigation of the oriental cycads, a group which is not even suspected of having any economic importance.

The cycads are a gymnosperm family whose remote ancestors were abundant in the Paleozoic age, and whose less remote ancestors were abundant and had a world-wide distribution in the Mesozoic. Now, only nine genera remain, and these are confined to tropical and subtropical regions, and even there they are very local in their distribution. Four genera are western and five eastern. Of our four western genera, one ranges from Florida to Chili, two are found only in Mexico and one, only in Cuba. Of the eastern genera, one ranges from Japan to Australia, two are found only in Australia and two only in South Africa.

Having already made a ten years' study of the American forms, especially the Mexican genera, which I had collected during four visits to the Mexican tropics, it was necessary to make a similar study of the oriental forms before any safe conclusions could be drawn in regard to relationships and evolutionary tendencies. Now, with abundant material of all the genera and many of the species, a study of development and evolutionary tendencies should yield valuable results, especially since the Paleozoic ancestors are becoming well known through

the researches of various English botanists, and the Mesozoic forms are being cleared up by Professor Wieland, of Yale.

A glance at a globe or map will show that the trip was not only round the world from east to west, but also more than half the way around from north to south; further, that nearly all the journey was by water; about three months on the water, with less than three weeks by rail, and about three months on foot, or, occasionally, on horseback. Another glance at the globe will show that there was no need for any tongue but English. Why should there be a Volupuk or Esperanto, when English is becoming the universal language? Faddists may complain that English is too difficult, but most of the Maoris in New

FIG. 1. DENSE FOREST AT OHAKUNE, NEW ZEALAND.

Zealand speak it, and my Maori guides spoke it even better than the average American high-school girl, for the Maori guides speak English without slang. Many of the Zulus in Africa now speak our language.

The stay in New Zealand was brief, only four weeks, but by confining my attention to the north island and following the suggestions of Professor Thomas, the botanist of the University College at Auckland, I was able to see a great deal of the botany of that peculiar region. New Zealand is well within the temperate zone, but not far enough south for severe winters, so that the landscape is green all the year round, most of the trees which shed their leaves at regular intervals being exotics like the willow and poplar. Late in September several species of willows and poplars were just coming into leaf and the

apples, peaches and cherries were in full bloom, for September is spring and January is midsummer.

There are splendid forests in the north island, but there are also large areas covered by the bracken fern (*Pteridium aquilinum*) and worthless, but very dense shrubs. When once cleared, the ground is valuable, for it is extremely fertile and the climate is ideal for raising crops. New Zealand has a hearty welcome for the settler, and the country is prosperous, so prosperous that it is hard to get a man to carry a camera or collecting outfit, for every man has a job and every boy is in school. I did not see a beggar in New Zealand. Women vote under the same conditions as men and neither the country nor the women seem to have suffered any damage.

After tramping for several days in the vicinity of Auckland, I divided the rest of my time between the forests of Ohakune and Owharoa, and the hot springs district about Rotorua.

The forests about Ohakune consist principally of two conifers, *Podocarpus* and *Dacrydium,* both large trees, reaching a diameter of six or seven feet and a height of nearly 200 feet. The branching is mostly in the upper third of the tree, and, consequently, the lumber, which resembles white pine, is very clear. The saw mill at Ohakune and the methods of lumbering are not on so large a scale as in our own forests. A six-foot log must be split before it goes to the saw.

Ohakune is a botanist's paradise. While there is no need of an ax to clear the way, the forest is like a labyrinth and one must take great care not to get lost. (Fig. 1.) In a Mexican forest one never gets lost, because the necessary use of the machete blazes a trail which one can easily follow back; but in this labyrinth at Ohakune, without any thread, I got lost within half a mile of my hotel. The tree ferns, *Dicksonia* and *Cyathea,* are abundant, while smaller ferns cover the ground and hang from the trees. In our own flora only two families of ferns, the Osmundaceæ and Polypodiaceæ, form any conspicuous feature of the landscape; but at Ohakune all the seven time-honored families are present and abundant.

Snow falls every winter, often a couple of inches deep on the level. This was a great surprise to me, for I had always associated the filmy ferns and tree ferns with rather tropical conditions, but here the snow collects in the nests formed by the crowns of the larger ferns, while it entirely covers the smaller filmy ferns. Two much-prized species, the prince's feather (*Todea superba*), a magnificent fern almost never seen in conservatories, and the kidney fern (*Trichomanes reniforme*) are very abundant here.

The object of the trip to Owharoa was to see the kauri forests (Fig. 2). The kauri (*Agathis australis*) is the most important timber tree of New Zealand and it also furnishes the gum from which dammar

FIG. 2. *Agathis australis*, THE KAURI, AT OWHAROA, NEW ZEALAND.

varnish is made. It reaches a height of 200 feet and a diameter of eighteen feet; but this is exceptional, specimens eight feet in diameter being regarded as very large trees. The trunk is straight and symmetrical and often measures a hundred feet up to the first branches, with a diameter of five or six feet where the branching begins; and, consequently, the lumber is very clear, closely resembling a very high grade of white pine. The forest is not at all pure, for there are many other kinds of trees, some of them not very important as timber. The methods of lumbering are as wasteful as in our own country, the fallen timber being allowed to thunder down the mountain side, tearing up all the smaller trees in its path. Since the large kauris are thousands of years old, some estimates running as high as 5,000 years, a timber company could hardly be expected to make any serious attempt at reforesting. However, there are a few government preserves, so that the big tree will not become entirely extinct. New Zealand has advanced ideas on conservation, for its recreation, forest and scenic reserves already include about 3,000,000 acres.

To the average traveler, the thermal region about Rotorua is the most interesting place in New Zealand. An oasis in the desert, or a park in a city, is easily superior to its surroundings; but a health resort in the healthiest country in the world must have inherent advantages of the highest order. Rotorua is recognized as the Baden Baden of the South Seas, and probably no springs in the world surpass those of the Rotorua district, for some springs are boiling hot, some are warm and some are cold; some are clear as crystal, and some consist of boiling, spluttering mud. The mineral properties are no less varied than the appearance and the temperature. The government has erected an extensive series of baths where one may get a good bath for as little as three pence. Whether the baths have all the curative properties claimed for them may be a question, but they are certainly refreshing and invigorating.

The region is not only uncanny and spectacular, but it is profitable both to the government and to the native; for the government manages the baths and is interested in many of the hotels for tourists, and the native Maoris find easy, lucrative employment as guides (Fig. 3). Besides, for the Maori, the natural heat boils the potatoes, fries the eggs, and furnishes hot water for the washing.

No large geysers are playing in this immediate vicinity, but vigorous thermal activity is apparent, and in 1886 the eruption of Tarawera threatened to destroy the whole Rotorua district. Numerous little lakes, of various colors and temperatures, add to the variety and beauty of the landscape (Fig. 4).

The natives of New Zealand, the Maoris, have several villages in this neighborhood. Many of them are well-to-do, have adopted Euro-

FIG. 3. GENERAL VIEW IN THE THERMAL REGION NEAR ROTORUA, NEW ZEALAND.

pean dress and are sending their children to school. With few exceptions, the most experienced and satisfactory guides in the thermal district are young Maori women, who speak English perfectly, and, as nearly as I could determine, have about the education afforded by a first-class grammar school in our country.

On the whole, New Zealand is a remarkable country. The climate is delightful, never uncomfortably warm or uncomfortably cold, no droughts or floods, a landscape green all the year round, even deciduous exotics remaining in leaf longer than with us, a country of fertile plains, beautiful lakes and lofty forests, it is not strange that it should have the lowest death-rate in the world. In the years 1896–1907 the death-rate averaged only 9.86 per thousand. Epidemics like cholera and smallpox are unknown. In wealth, as in health, New Zealand leads the world, for in 1908 the average private wealth per capita was $1,675, and the wealth is increasing. Even teachers share in the general prosperity; I doubt whether any botanist in the world has an estate equal to that of Dr. A. P. W. Thomas, the professor of botany in the University College at Auckland.

The government is progressive, run by the people (including women) in the interest of the people; politics are not controlled by machines; there are no trusts; the government owns the railways, telegraph and telephone lines, has operated for about forty years a postal saving bank which now has about $60,000,000 in deposits, and has a life-insurance department carrying about the same amount in policies. The principal need of the country is people; there is still plenty of room, and the unusual inducements offered to colonists should attract the needed population.

The investigation for which the trip was undertaken really began when I reached Australia, for there are no cycads in New Zealand.

Australia is a large country with an area almost exactly equal to that of the United States, but with a population scarcely equal to that of Illinois. The states are few, but large, most of them being larger than Texas. They are loosely federated, but the tendency is toward closer federation. The government of the various states owns the railways and other public commodities, and the political situation resembles that in New Zealand.

The harbor at Sydney is the finest in the world. It could accommodate all the navies of all nations, and still have room enough for all the liners of the Atlantic to unload at once. While such practical features dominate in a new country, it must not be forgotten that Sydney, until very recently, had the largest pipe organ in the world, and that even now, on account of its perfect position, the organ is probably the most effective in the world. The organist is a regular officer of the city, and gives free recitals every Sunday afternoon.

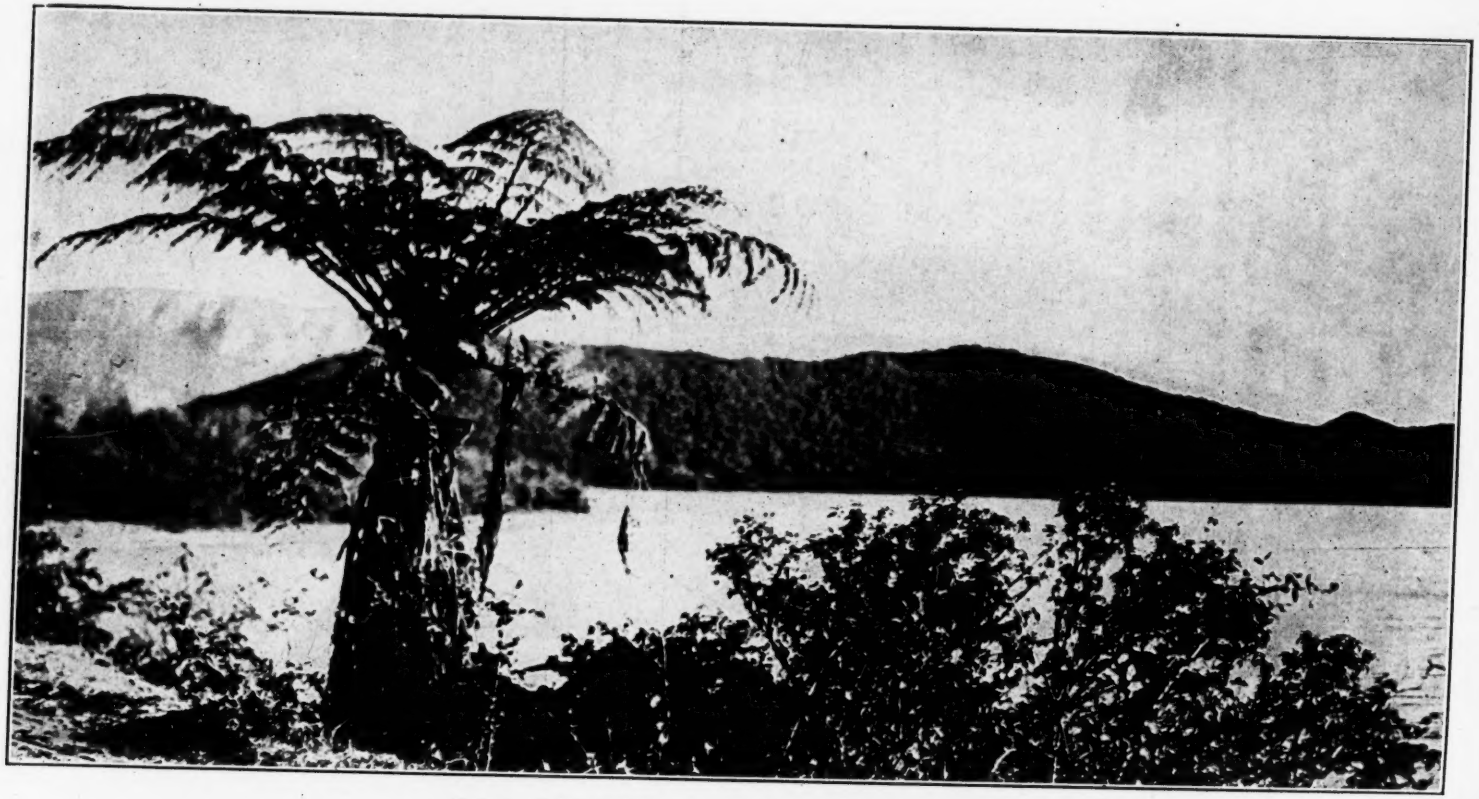

FIG. 4. LAKE TIKITAPAU, NEAR ROTORUA, NEW ZEALAND.

Other things might be mentioned to show that in the strenuous material development, the humanities have not been forgotten.

Naturally, as soon as I arrived in Sydney, I went to Professor Maiden, the director of the Botanic Gardens, well known to botanists by his work on Eucalyptus, the most characteristic of all Australian trees. I had expected to get from him some information and advice, but I was entirely unprepared for the splendid hospitality and generous assistance which I received and am still receiving, for he not only gave me valuable material from the garden and sent a competent collector to accompany me during my trips in the vicinity, but he has had the histologist of the gardens prepare some of my material for future use.

In many ways, the gardens at Sydney surpass any I had ever seen, and I have seen the gardens at Kew and Berlin. Palms from Mexico, Chili, the West Indies, the South Sea Islands and other places, grow as well here as they do in their native haunts (Fig. 5). Here, too, are tree ferns and other ferns, and gorgeous flowering trees like the flame tree (*Poinciana regia*) with its flaming red flowers, and *Jacarandra mimosæfolia,* a Brazilian tree fifty feet high and bearing great clusters of lilac-colored flowers before the leaves appear. Characteristic of all the Australian gardens are the various species of *Araucaria* and *Agathis.* Most of these beautiful trees, shrubs and ferns are too large to be grown effectively in a greenhouse and can not be grown out of doors in our latitude on account of the cold winters, so we can never hope to see in this country a garden like that at Sydney.

In addition to the botanical display there are numerous statues. The judgment displayed in their selection is beyond criticism, for you see no crude productions of local genius, but classics, like Castor and Pollux, the Farnese Hercules, the Discobolus, and others of equal merit.

An excellent museum and a large herbarium, devoted principally to Australian material, add to the scientific value of the gardens.

Three genera of cycads grow in Australia, *Cycas, Macrozamia* and *Bowenia,* the first ranging from Japan to Australia, and the other two being confined to Australia. The cycads in the gardens include all the genera of the family, except *Microcycas,* and the collection of *Macrozamia* is, beyond doubt, the finest in the world. After studying this splendid collection and spending a day at Avoca, where *Macrozamia spiralis* forms such dense thickets that one can hardly crowd his way through, I went to Brisbane, 725 miles north of Sydney, but still 400 miles south of the Tropic of Capricorn.

Here, again, I sought the botanical gardens, and at once met Mr. F. M. Bailey, the government botanist, author of the Queensland Flora. Although more than eighty years old, he is still at work and was able to describe accurately the habitats of all the Queensland cycads. His

son, Mr. J. F. Bailey, director of the garden, and, like his father, thoroughly acquainted with the Queensland flora, accompanied me on a four days' trip, during which he showed me *Macrozamia Denisoni*, growing on the top of Tambourine Mountain. It is a beautiful cycad, regarded by some as the most beautiful species of the family, and has an immense cone which reaches a weight of seventy pounds.

Although cycads were always dominant in my plans, one of the most delightful and profitable experiences of the whole trip was an excursion to Tabby-Tabby Island. Mr. Bailey had promised to show me the staghorn fern (*Platycerium*) and accordingly went from Tambourine Mountain to Tabby-Tabby, a small island owned by Mr. Wm.

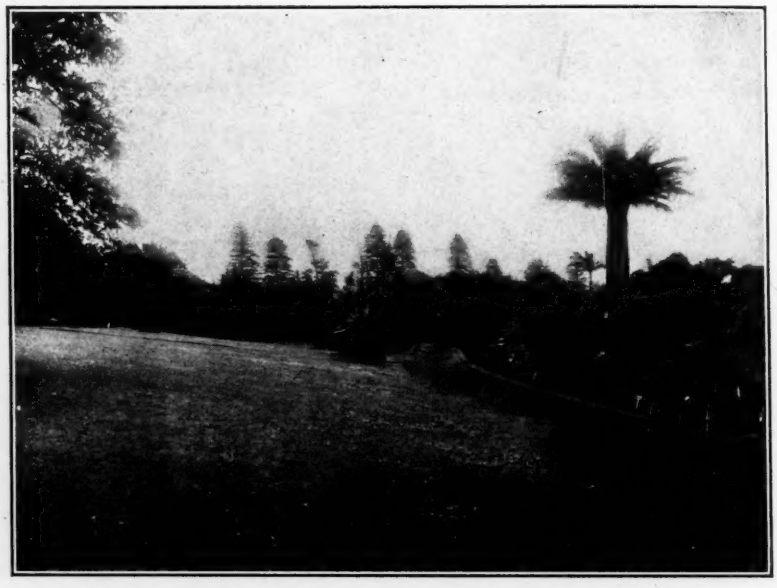

FIG. 5. VIEW IN THE BOTANIC GARDEN AT SYDNEY. The large palm is *Jubea spectabilis*, a native of Chili.

Gibson, who entertained us royally and took us out in his motor boat to the home of the peculiar fern. I had seen fine specimens in greenhouses, but nothing to suggest the wonderful display on the islands about Tabby-Tabby. One specimen was eight feet wide, and specimens four, five and six feet wide were common. It was easy to get a score of ferns on a single photographic plate, and often one could get both species, *Platcerium grande* and *P. alcicorne*, on the same plate. Many of the trees were so loaded that they were leaning, and some had even fallen on account of the great weight of the growing ferns (Fig. 6).

Besides the botanical garden, with its extensive collections, Brisbane has an acclimatization garden, in charge of Mr. Soutter, devoted particularly to experiments in acclimatizing plants, the work being

similar to that conducted by our own Department of Agriculture at Washington.

While Brisbane is a business city, inclined to emphasize the practical side of everything, the fine arts are not entirely ignored. There is a large art gallery, a fine library and museum, and, in the town hall, a splendid organ upon which regular recitals are given, as in Sydney.

Rockhampton, about 400 miles farther north, is situated on the Tropic of Capricorn; its principal newspaper is the *Capricornian.* Here, too, I at once sought the director of the botanical garden, Mr. Simmons, who continued the same generous hospitality and helpfulness which had made previous work so successful. The cycad collection in the garden was not very extensive, probably because cycads are so abundant in this vicinity that it does not seem worth while to bring them in.

Mr. Simmons took me out in a carriage, and within less than an hour's drive, showed me *Cycas* and *Macrozamia* growing together. The owner of the land, Mr. Snell, is related to the Snell who gave Snell Hall to the University of Chicago, and so we were acquainted at once. The study was rapid and satisfactory, for, just to let me see the anatomy of a trunk or structure of a bud, Mr. Snell chopped down plants which would have been the pride of the conservatory in Kew or Berlin.

About 40 miles from Rockhampton, at Maryvale and Byfield, *Bowenia spectabilis* var. *serrulata* is very abundant, forming a dense but easily penetrated undergrowth in the ever-present eucalyptus bush. This small cycad richly deserves its specific name, *spectabilis,* for the leaves are smooth, have a rich dark green color, and retain their beauty for several days after they have been cut off. It seems strange that *Bowenia* is almost never found in greenhouses.

At Springsure, about 200 miles west of Rockhampton, a fine cycad, *Macrozamia Moorei,* is being exterminated because it causes "rickets" in cattle, a disease which usually proves fatal.

Ever since I landed at Sydney, botanists had advised me to visit the Cairns district for a view of genuine tropical vegetation. Although Cairns is 700 miles north of Rockhampton and without any railway connection, it seemed worth while to make the trip by the small coasting boats. In density, the Cairns jungle surpasses anything I had ever seen in the Mexican tropics. The profusion of palms, tree ferns and various vines and epiphytes was bewildering. Along the streams *Angiopteris,* a remarkable fern, small specimens of which are occasionally seen in greenhouses, reaches a tremendous size, with leaves nearly twenty feet long and stalks as large as a man's arm. At Herberton, near Cairns, a beautiful tree fern, *Dicksonia Youngii,* is so abundant that it forms almost impenetrable jungles. Besides, in open places, all three genera of cycads found in Australia may be secured within a single day's tramp.

In this region I had my first view of the Australian bushman, and he is certainly the lowest of all the natives I met during the whole trip. I could admire his boomerang and the way he threw it, and also his almost ape-like agility in climbing trees, but he hardly seems to be reassuring material for civilized citizenship.

Although a year's field study of the cycads about Cairns and north of Cairns would doubtless have proved productive, I had no more time,

FIG. 6. *Platycerium*, THE STAG HORN FERN.

and had to hasten to meet my boat sailing from Sydney on December 16, 1911. There are few cycads south of Sydney, and consequently, a steamer stop of three days at Melbourne finished the work in Australia.

Although Melbourne is about 1,500 miles south of the Tropic of Capricorn, the climate is mild, and palms, tree ferns, cycads and araucarias flourish in the botanical gardens. The director, Mr. Cronin, was particularly proud of the tree fern display, which could hardly be

surpassed. For scenic beauty the garden at Melbourne deserves a high rank among the great botanical gardens of the world.

After a long voyage of twenty-six days, we arrived at Durban, the principal port of South East Africa. Here I was the guest of Dr. J. B. McCord, a medical missionary, and a fellow alumnus of Oberlin College, whose knowledge of South Africa, and especially of Zululand, greatly facilitated my investigations.

At the botanical garden I met the director, Dr. J. Medley Wood, now an old man, and Mr. J. Wylie, the curator, who is particularly interested in palms and cycads. Mr. Wylie at once became interested in my work and not only helped me with my study of the cycads at the

FIG. 7. A KRALL IN ZULULAND.

garden, where the collection of *Encephalartos* is the largest and finest in the world, but he accompanied me into the field and sent a Zulu from the garden to be my guide and factotum during my stay in Zululand.

There are only two genera of cycads in Africa, *Encephalartos* and *Stangeria,* and they are found only in South Africa. I found both genera in Zululand and secured an abundance of material for further study.

The Zulus are a superior race, both physically and mentally, thanks to the practical eugenics of the good old days before the English came, when deformed or sickly babies were promptly killed, and thus prevented from propagating their failings.

FIG. 8. *Euphorbia tetragona*, NEAR CATHCART, SOUTH AFRICA.

The young man must work hard to get his first wife, for wives cost about $500 apiece. Then, with a helpmeet, it is easier to get the second wife, and a third wife comes still more easily. There is no reason why a man with three wives should work any more, and so life becomes easy for him. As he gets older, he has daughters to sell, and can buy more wives. The average well-to-do Zulu has from half a dozen to a score of wives and it is not unusual for a chief to have several hundred. A man with only one wife has about the same standing as a slaveholder with only one slave had in the south before the Civil War, and, consequently, the earlier wives are eager to work hard to elevate the standing of the family. The whole family lives together in a collection of huts, called a krall (Fig. 7), each wife having a hut of her own, and the polygamous husband boarding around. You can tell the number of wives in a family by counting the houses in a krall.

At Cedara, a government experiment station about eighty miles northwest of Durban, the extensive work in forestation is interesting from both the botanical and economic standpoints. This work is under the direction of Mr. Stayner, who has received all the training Kew affords. Many believe the extensive grass velts of South Africa were originally covered by forests, and that the native, with his childish desire to see things burn, had destroyed the forests before white people

arrived. At any rate, trees grow rapidly on the velts, especially on the mountain sides, and if the forestation continues, within a short time there will not only be an abundance of lumber, but the climate of the country will be vastly improved.

Stangeria and two species of *Encephalartos* grow in the neighborhood, but are not abundant. There are gorgeous flowers on the grass velts, and in the ravines, or *kloofs,* there are many ferns and lycopodiums.

The next point on my schedule was Queenstown, not very far from Cedara, as the crow flies, but quite remote as South African railways go, through Ladysmith, Bethlehem, Bloomfontein and Springfontein, names made familiar by the Boer war, a country dotted with monuments and cemeteries.

At Queenstown, the president of the bank, Mr. E. E. Galpin, is a fellow of the Linnean Society of London. He kindly arranged for a day's absence from the bank and not only showed me a great display of *Encephalartos Frederici Guilielmi,* a species I had never seen, but gave me valuable information which only a competent observer could give after many years' acquaintance with the locality. Mr. Galpin also facilitated my work at Cathcart and gave me directions for finding *Encephalartos Lehmannii,* which, as yet, I had seen only in gardens. Near the Kei River, where I found this species, *Euphorbia tetragona* is a prominent feature of the landscape, a big tree, reaching a height

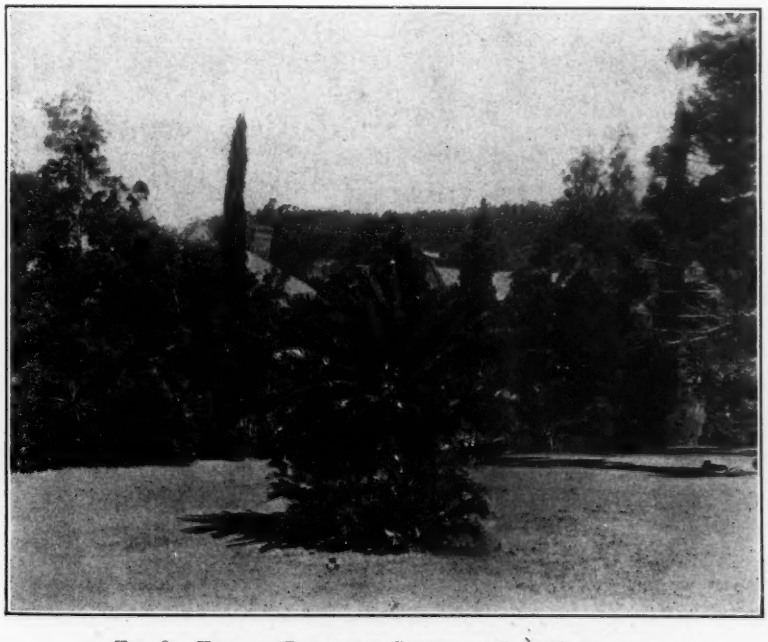

FIG. 9. VIEW IN BOTANICAL GARDEN AT PORT ELIZABETH.

of 60 feet (Fig. 8). I am further indebted to Mr. Galpin for an introduction to his brothers, the Galpin Bros., wealthy jewelers and competent amateur botanists, of Grahamstown, who took me in their touring car to all the cycads within easy touring-car reach of the city.

Grahamstown is an educational center, with a good college, a conservatory of music and an excellent museum. Dr. Schönland, the professor of botany in the college, gave me an account of the cycads of the vicinity, including the almost unknown *Encephalartos latifrons*.

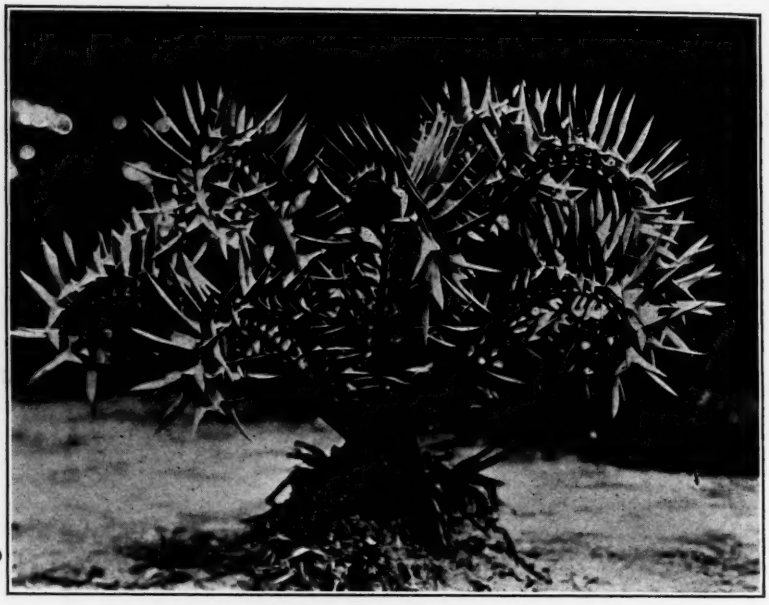

FIG. 10. *Encephalartos horridus* IN ST. GEORGE'S PARK, PORT ELIZABETH.

The botanical garden at Grahamstown maintains the high standing I had learned to expect in the botanical gardens of the English colonies (Fig. 9). The director, Mr. Alexander, gave me some valuable specimens which are now flourishing in the greenhouse at the University of Chicago.

I had two more points, with outlying side trips on my schedule, East London and Port Elizabeth. On the voyage from Vancouver to New Zealand, I mentioned at table to Mr. Vance, who sat beside me, that I could find out but little about these places. Naturally, I was surprised and delighted to find that he had been mayor of East London for years and that his wife knew the cycads of the vicinity and could give me definite directions for finding them.

When I arrived at East London, Professor Rattray, of Selborn College, accompanied me into the field, and although he did not claim to be a botanist at all, showed such an extensive and critical field

knowledge of South African cycads, that I asked him to prepare an article for the *Botanical Gazette*. Other plants of the vicinity were also of interest, but my time was becoming short.

The final point on the schedule, as far as cycads were concerned, was Port Elizabeth, where Mr. Butters, the director of St. George's Park, gave me definite information and accompanied me on the trips into the field. From this place I visited Van Staadens, the type locality of *Encephalartos caffer*, and Despatch, a good locality for *Encephalartos horridus*, a frightful species which holds its place in the conservatory as the gargoyle does in architecture, by its forbidding aspect. With its spiny leaves, as threatening as porcupine quills, it deserves its specific name (Fig. 10). It is a pity that nomenclature should be burdened with names like *Altensteinii, Lehmannii, Frederici Guilielmi, Vroomi* and *Purpusi*, when suggestive names like *spinosus, pungens, sanguineus, ferox* and *tribulosus* are still available; but taxonomists will do it.

The object of the trip was now far more thoroughly accomplished than I had dared to anticipate when I left Chicago, for I had seen all the oriental genera of cycads, and most of the species, growing in the field, and had not only secured notes and material, but had arranged to have plants sent to Chicago and had also arranged to have histological material fixed at short intervals for a year, in order to make sure of a complete study of life histories. Much of this would have been impossible had it not been for the unbounded hospitality which everywhere facilitated the work.

Of the few days at Cape Town, while waiting for the boat, one was spent at Stellenbosch, the Athens of South Africa, one on Table Mountain, one at Glen Cairn, an excellent place for marine algæ, and two or three at the South African College. This college is the hope of higher education in South Africa. Its department of botany includes three botanists of international reputation and doubtless other departments are also of high rank, so that the college deserves to rank with first-class institutions of other countries.

The trip back to Chicago was tedious but comfortable, for I was not troubled by seasickness, only one day out of more than ninety days upon the water being marked against my record.

For one who is only an investigator and not at all adventurous, such a trip can hardly be said to have any dangers, except the usual dangers of the sea and, perhaps, some dangers from snakes in South Africa. Long tramps, hard climbing and some hot weather must be expected, but a man of middle age and in fair health should come back stronger than when he started, and the investigator and teacher is sure to come back with abundant material for his research, his lecture-room and his laboratory.

SOME ASPECTS OF ANAPHYLAXIS

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THE word anaphylaxis is used to designate the train of symptoms and signs which is produced by the incorporation of a foreign soluble proteid into an animal organism which has already been subjected before to the action of this same foreign proteid. The first injection need cause no obvious disturbance at all, and the injected animal seems to be perfectly normal. But if this animal be reinjected after an appropriate interval, it will answer with marked reactions, which may even end in death. Thus, for example, 5 to 6 cubic centimeters of horse serum injected intraperitoneally in a guinea-pig cause no more apparent disturbance than the same quantity of physiological salt solution; but if the same animal receive the same amount of the same horse serum intraperitoneally after two or three weeks, the animal usually dies in a short time. The first injection, therefore, though it caused no obvious change in the animal, has profoundly altered its constitution, and it reacts on second injection as if the original substance were now a violent poison. The animal, however, does not acquire this remarkable property at once; approximately ten to fourteen days must elapse before the second injection elicits marked toxic effects. If the injection is repeated earlier, slight or no symptoms will be produced. It is thus clear that the organism requires a certain length of time before the second injection can call forth toxic symptoms. The whole process, then, shows three distinct phases:

(1) *Sensitization,* caused by the first injection of the foreign proteid; (2) *Incubation,* the time which elapses before the second injection can cause a response; and (3) the state of *Intoxication* which this second injection causes when given to a sensitized animal.

These three stages show some interesting points which deserve to be mentioned more in detail.

Sensitization.—Any soluble proteid may be used to sensitize an animal, provided that it is of foreign nature; nor need these proteids be of animal origin; Wells has recently shown that a large number of plant proteins may be used for this purpose.

The proteid usually employed in laboratory investigation, for anaphylaxis can only be studied by animal experiment, is horse serum, and horse serum is used only because it is easily obtainable, and is not poisonous to the ordinary laboratory animals on first injection. A

normal guinea-pig will easily tolerate five, a rabbit twenty and a dog one hundred cubic centimeters intravenously, without showing any obvious effect on blood-pressure or respiration. Harmlessness on first injection is, however, not an absolute essential, and animals may easily be sensitized by primarily toxic sera or poisonous animal extracts, for the amount needed to sensitize is very slight, and is only a small fraction of the lethal dose.

The amount necessary to sensitize is almost unbelievably minute; according to Rosenau and Anderson, 0.000,001 cubic centimeters of horse serum may suffice for a guinea-pig, and Wells has succeeded in sensitizing the same animal species with a still smaller quantity of pure egg albumen, 0.000,000,05 gram. These quantities are beyond the capacity of any balance or test tube to detect, and the biological reaction, as usual, is shown to be the most delicate.

The substance used for sensitization may be incorporated in a variety of ways: by subcutaneous, peritoneal or intravenous injection. Even by feeding the proteid, sensitization may be produced in the guinea-pig according to Rosenau and Anderson. The usual method employed, however, is either subcutaneous or intraperitoneal injection; both these procedures are swiftly and easily carried out, and give but slight or no discomfort to the animal.

Although not every species of animal has been tested, it seems probable that all may be sensitized. The only difference noted is that some species are more difficult to sensitize than others; the guinea-pig is most easily sensitized of all animals tested so far, and for this reason has been the classical animal for investigation. The dog and the rabbit are also rendered hypersusceptible with comparative ease. Fowl are more refractory; man also can be sensitized.

The length of time that sensitization lasts varies in the different animal species. In the guinea-pig that state persists for life, which is about three years (Rosenau and Anderson). In the rabbit the degree of sensitization diminishes after three or four weeks, but persists to a greater or less extent for many months, and in man symptoms have been noted seven years after the first injection.

The degree of sensitization varies also in the different animals and will be considered more fully later.

Incubation.—After the animal has received an unaltered foreign proteid into its circulating juices, this foreign material causes a profound change in the reactions of the host to this proteid. This change occurs gradually and reaches its maximum only after some weeks. If the animal is tested after a few days no reaction will be obtained. In guinea-pigs, for example, ten to fourteen days must elapse before an anaphylactic response can be expected with some certainty, and even with these animals it is best to allow three weeks to pass before testing.

The period of incubation, however, may be shortened if an animal is rendered *passively anaphylactic.* This process depends upon the fundamental observation of Gay and Southard that a normal guinea-pig may be sensitized by injecting it with the serum of another guinea-pig which is already sensitized. If a normal guinea-pig is thus injected with the serum of an animal (guinea-pig, or rabbit more usually) which was sensitized some weeks previously, this normal guinea-pig becomes fully sensitized within twenty-four hours and will respond with typical symptoms when injected with the same proteid which was used to sensitize the donor of the serum (Otto). The serum of an actively sensitized animal, that is, one sensitized by the injection of a foreign proteid, therefore contains some substance, termed a serum-rest or anaphylactin by Gay and Southard, which upon injection fully sensitizes a normal animal within a few hours.

Intoxication.—In this stage we observe how a sensitized animal responds with violent symptoms to an injection of the same proteid which it formerly tolerated with no apparent ill effect; we see the remarkable transformation of what formerly was an apparently harmless substance into a violent poison. The symptoms and signs noticeable in an animal during this stage vary with the species and with the site of injection of the toxic dose. If the injection is given subcutaneously in rabbits, an area of edema develops in the place injected; this edema may gradually lead to a circumscribed necrosis of the skin (phenomenon of Arthus). The same change may also occur in guinea-pigs, as Lewis has shown. If the second injection is given intravenously in rabbits, a more or less marked respiratory disturbance associated with muscular weakness and increased peristalsis develops (Arthus); if the rabbits are highly sensitized, convulsions followed by death occur in a few minutes (Arthus). In the dog, the respiratory symptoms are not prominent, but the animal shows nausea and vomiting, profound muscular weakness and often discharge of urine and feces. The animals, however, usually recover. In the guinea-pig, the stage of intoxication is dominated by respiratory symptoms. The animal makes such powerful respiratory attempts that the costal arch is drawn inwards with each inspiration; these efforts swiftly become convulsive and the animal dies a few minutes after the intravenous injection of an adequate dose (Auer and Lewis).

Anatomical and Functional Changes Found in the Stage of Intoxication.—The study of anaphylaxis from the clinical symptoms alone is unsatisfactory. The symptoms offer nothing which could not be produced by numerous drugs available to the investigator; they do not indicate *why* the animal shows these disturbances. For an adequate picture of the process the seat of these reactions and a finer analysis of the functional disturbances is necessary. Moreover, no rational thera-

peutic intervention is possible if the investigator is in the dark concerning these points. The first attempt to study anaphylaxis more thoroughly was made by Arthus in 1903. This investigator showed for the first time that anaphylaxis in rabbits is characterized by a marked drop in blood pressure. This drop in blood pressure Arthus considers the most delicate indicator of anaphylaxis. In 1910 Cesaris-Demel described the effects which were produced when the *excised* heart of a sensitized rabbit was perfused with a dilute solution of the same proteid which caused sensitization. He stated that such a heart rapidly decreased the amplitude of its beat and assumed a condition of greater tonus; toxic effects were also noted on normal hearts, but by no means as pronounced as in sensitized hearts. In 1911 Auer showed independently that the heart of an intact anaphylactic rabbit of sufficiently high sensitization rapidly fails to do its work, and that the animal succumbs for this reason. The functional basis for this heart failure was shown to be a complete or almost complete loss of direct irritability of the heart ventricles. On macroscopical examination of the heart muscle, the right ventricle shows a toughening of the muscle bands on its endocardial surface when scraped by the finger nail. The left ventricle does not show this toughening, except now and then on its papillary muscles. The same observer also demonstrated that these cardiac changes were obtained after section of the vagi, and after destruction of the central nervous system, thus proving that the fatal cardiac reaction was not due to central, nervous influences, but was of peripheral origin. He also noted the absence of any marked disturbance of the lungs in anaphylactic rabbits.

In dogs, Biedl and Kraus, and later Arthus, proved that the main symptom of anaphylaxis was a rapid, profound and long-lasting drop in blood pressure. Experimental evidence led Biedl and Kraus to the view that this fall was due to a paralysis of the vasomotor endings in the splanchnic area. Associated with this drop in blood pressure the same observers noted a diminution in the number of leucocytes, and an extreme loss of coagulability of the blood. Blood drawn from a dog during the anaphylactic state remained fluid for many hours, sometimes days. The respiratory function showed no noteworthy alterations. The dogs recovered as a rule.

The functional alterations produced by anaphylaxis in guinea-pigs is entirely different from those observed in rabbits and dogs. In the guinea-pig, Auer and Lewis showed that the functional interference occurs in the lungs. Within a few seconds after the intravenous injection of an adequate "second" dose the animal shows greater and greater difficulty in getting air into and out of its lungs, until finally a stage is reached where no air at all enters on inspiration and this in spite of the fact that the animal makes most violent inspiratory attempts. Three

to five minutes after the injection respiration ceases and the animal dies of asphyxia. The heart keeps on beating for many minutes after all respiration has stopped. Inspection of the lungs shows a remarkable picture; on opening the thorax, the lungs do not collapse as normal lungs do, but remain fully distended and form a cast of the thoracic cavity (see Fig. 1). Their color is pale bluish pink and the lungs are light in weight. The same lung picture was obtained with equal promptness when the vagi were cut or when the central nervous system was destroyed, thus demonstrating that this lung condition was of peripheral origin and independent of the central nervous system for its production. On the basis of experimental evidence which need not be detailed here, Auer and Lewis conclude that this striking lung condition is produced by a tetanic contraction of the muscles in the finer bronchial tubes. On the basis of this, atropin was used prophylactically with good results, 72 per cent. of the treated animals recovered, while 75 per cent. of their untreated mates succumbed (Fig. 1). The blood-pressure curve in these fatal cases does not resemble that seen in dogs, nor does the blood show a strongly increased coagulation time.

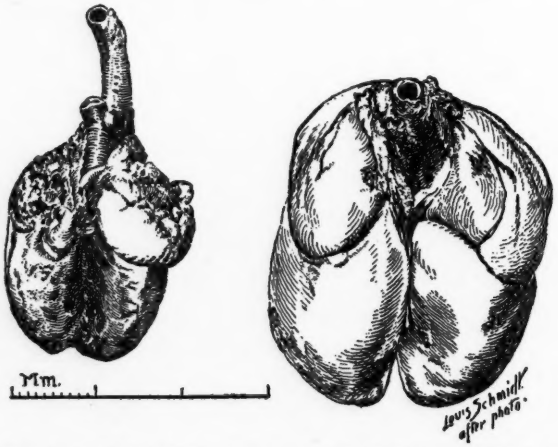

FIG. 1. The large inflated lungs were obtained from a typical fatal case of horse-serum anaphylaxis in a guinea pig. The small collapsed lungs belonged to an anaphylactic guinea pig of the same lot which was saved by the injection of atropin. This animal seemed normal when killed. The picture shows strikingly the characteristic lung picture of anaphylaxis and the remedial effects of atropin.

The right vagus nerve had been resected in each guinea pig thirteen days before the toxic injection.

It will be observed that the important functional disturbances differ in the three species of animals which have been considered above: in the *dog,* the main noticeable effect is a profound, lasting drop in blood pressure associated with a great increase in the time necessary to cause coagulation; the lungs show no lasting inflation. In the *rabbit,* the heart stops beating and the cardiac muscle exhibits a total or almost

total loss of direct irritability to mechanical and electrical stimuli; the lungs show areas of emphysema, but collapse more or less completely when the thorax is opened; the blood shows delayed coagulability, but by no means as great as that observed in a dog. The fall in blood pressure is probably secondary to the failure of the heart. In the *guinea-pig,* the lungs are the chief organs affected and their function is abolished by a stenosis of the finer air passages preventing in the final stage both the entrance and exit of air, so that death results from asphyxia. The anatomical sign of this condition is furnished by the large inflated lungs which do not collapse on excision from the chest cavity (Fig. 1). The heart keeps on beating after final respiratory stoppage, with no obvious loss of irritability; the blood shows only a slight delay in coagulation and the fall in blood pressure is probably due to the fatal asphyxia. These differences between the three species of animals show clearly the necessity of judging each species by the anaphylactic signs characteristic for it and not by manifestations only found in another species. This important point, that each animal species must be measured by its own yard-stick when examined in anaphylaxis, has not been realized, unfortunately, by some investigators.

Causation of Anaphylaxis.—The remarkable phenomena which characterize anaphylaxis early led investigators to search for the causative agent. Numerous theories, more or less supported by experimental facts, were advanced to explain how, for example, the originally harmless horse serum becomes toxic when injected into an animal sensitized by this substance. The pioneer work of Vaughan, Friedemann and Friedberger deals particularly with this aspect of anaphylaxis. A discussion of all the theories here, however, would lead too far and would only befog the reader. It will suffice to state that the basic idea of the chief theory is that the sensitized organism has acquired the power to split the alien serum very rapidly into its components when injected for the second time, and that these components then act as a poison. There can be no theoretical objection to this conception; it is a legitimate working hypothesis. But there are weighty objections just as soon as one substance or mixture of substance is produced from proteids in the test tube by chemical or biological processes and considered as the causative agents of anaphylaxis because when injected into normal animals they produce more or less completely the signs and symptoms which are characteristic of true anaphylaxis. The assumption *may* be true, but no rigid proof has so far been advanced that these substances really are produced in the animal body during anaphylaxis. The mere fact that these toxic substances produce a lesion which also occurs in true anaphylaxis, by no means justifies the conclusion that the causative agents were the same in the two processes. Take, for example, the pale, rigid, distended lungs produced in a sensitized guinea-

pig which succumbs acutely to an intravenous injection of horse serum, and which are diagnostic, when properly considered, of true anaphylaxis in this animal. These lungs owe their state to a tetanic contraction of the bronchial muscles, so that the enclosed air is imprisoned in the alveolar sacs and can not escape even when the lungs are completely excised (see Fig. 1). Now, any adequate stimulus which causes an enduring contraction of these muscles while respiration goes on will produce a greater or less approximation to the lung picture of anaphylaxis. Such adequate stimuli are furnished by a large number of substances, of which we may mention muscarine, eserine, pilocarpine, digitaline, veratrine, morphine barium chloride and the salts of many heavy metals (Dixon and Brodie). Nobody, however, would state that the substances cause anaphylaxis, that they are anaphylatoxins, even though they do produce apparently a lesion of anaphylaxis, for it is perfectly obvious to every one that it is inadmissible to conclude from the identity of reaction produced (in the example chosen, the anaphylactic lung) an identity of the causative agents, as this leads to the ridiculous conclusion that eserine, muscarine, etc., are identical. The same reasoning is applicable to the degradation products obtained by chemical or biological means from proteids. It is not surprising that decomposition products of the infinitely complex proteid molecule should yield substances which are toxic to an organism, and which produce anatomical and functional changes similar to those observed in anaphylaxis, but this does not permit the conclusion that the same decomposition products are formed and exert their actions in true anaphylaxis; such reasoning commits the same error which was mentioned before. It must be insisted that an identity in the biological response caused by a variety of substances permits only the conclusion that these substances are *functionally* identical, not that they are chemically or so to say, morphologically identical. This confusion is widespread, and at present dominant; it is especially due to the *per se* valuable and interesting contributions of Friedberger and his colaborers. Friedberger is convinced that the poisonous mixture which he produces by biological methods in vitro is identical with the causative agent or agents in true anaphylaxis, and in most of his recent work the symptom complexes studied were not true anaphylaxis, but the symptoms produced on first injection by his anaphylatoxin.

The question has probably occurred to the reader why this problem was not approached directly, why, for example, the serum of animals in anaphylaxis was not examined for the presence of these degradation products which are said to play such an important rôle. The test can easily be made, for the split products of proteids which have an albumose or pepton character give the biuret reaction. But no investigator, as far as I am aware, has been able to obtain more than a very feeble or

no reaction from the serum of an animal dead from true anaphylaxis, provided that the test was carried out after the total removal of all coagulable proteids, thus leaving the non-coagulable peptones and albumoses in the filtrate. This method, therefore, gives no evidence of any degradation product demonstrable by the biuret reaction (Pfeiffer and Mita).

The question was attacked in still another fashion by Abderhalden and Pincussohn. If the intoxication of anaphylaxis is produced by the rapid production of toxic cleavage products from the injected proteid, it is legitimate to assume that the serum of sensitized animals should possess ferments which rapidly accomplish this degradation of the proteid molecule. The experimental test was successful in demonstrating proteolytic ferments, but these ferments were not specific nor of very active nature; and later work by Gruber renders their relation to anaphylaxis quite doubtful.

Summing up the evidence which we have regarding the identity of proteid cleavage products and the causative agent or agents of true anaphylaxis, it must be said that while the assumption is theoretically tenable, a firm experimental basis for this assumption is yet to be laid. Moreover, investigators who unreservedly identify the disturbances caused by proteid constituents produced in vitro, with true anaphylaxis, are causing confusion in another direction. Not only is a perfectly well defined symptom-complex like anaphylaxis obscured by this extension of its scope, but a number of characteristic signs of anaphylaxis lose their significance. Before this can be discussed profitably, the original meaning of the word anaphylaxis as well as the functional disturbances and anatomical signs which characterize it, must clearly be kept in mind. On account of the importance of this, it may perhaps be permissible to give a short résumé of matter already discussed.

Meaning of the Word Anaphylaxis, and Diagnostic Criteria.—What the word anaphylaxis was coined to indicate has already been stated; it means the symptoms and signs which are produced when an organism is resubjected to the action of a foreign soluble proteid. When horse serum, for example, is employed, the first injection causes no untoward effects; the second injection, however, gives outspoken and pronounced results which did not occur after the first injection, and these effects are only obtained when a proper interval has elapsed between the two administrations of horse serum. In active anaphylaxis there are three well-defined stages—sensitization, incubation and intoxication. In passive anaphylaxis, where a *normal* animal is sensitized by the injection of the serum of a *sensitized* animal, the same three stages are present, but the period of incubation is now shortened to a few hours. If, therefore, reactions are obtained in an animal after the second or so-called toxic injection which were absent when the first one was given,

we are justified in speaking of the response as an undoubted reaction of anaphylaxis. The three conditions necessary for the employment of this word are fulfilled, and we are dealing with the same phenomena or group of phenomena which the older observers noted and which they called hypersensitiveness, Theobald Smith's phenomenon or anaphylaxis. If these considerations are followed a field of investigation with sharply defined borders is opened up, and every observer is enabled to judge whether or not his particular patch lies within this territory.

These criteria yield a sharply circumscribed mass of phenomena which are undoubtedly caused by the same general process, and which may now be further analyzed without any doubt, whether or not they are of anaphylactic origin. The more obvious signs and symptoms have already been established in dog, guinea-pig and rabbit, which are the animals usually employed in laboratory investigation. But it must be continually borne in mind that the characteristic anaphylactic responses of these three species are characteristic only when they are obtained after the second injection of a soluble proteid; the profound drop in blood pressure in the dog, the large immobilized pale lungs in the guinea-pig and the loss of irritability and contractility of the heart muscle in the rabbit, do not occur when a harmless soluble proteid like horse serum is injected for the first time; they only appear when the injection is repeated after the period of incubation, and this peculiarity characterizes them as anaphylactic and differentiates them at the same time from similar reactions which occur on first injection of a large number of substances.

These considerations render clear, perhaps, why it is not justified at present to admit that those cleavage products of proteids which cause a similar disturbance on first injection really produce true anaphylaxis, for as soon as this assumption is granted the three characteristic conditions of anaphylaxis which give this symptom complex an independent existence by delimiting it from similar complexes, is obliterated. Moreover, the clean and outspoken functional responses found in the three animal species in anaphylaxis lose their diagnostic character and independence, and fall back into the ruck, indistinguishable from a mass of similar reactions. This is surely a heavy price to pay for an extension of the meaning of anaphylaxis, especially as this extension is not necessary. Even when true anaphylatoxins are isolated, no such broadening of the term will be necessary, for only those substances can be considered true anaphylatoxins which are isolated biologically from the tissues and circulatory juices of a case of true anaphylaxis; and these substances must practically not be present in normal animals, but when injected into these normal animals the anaphylactic symptoms and signs characteristic for the species employed must be obtained. Such substances may be the product of proteid cleavage, but they will bear

the name of anaphylatoxins legitimately, for there is no cloud regarding their origin. Such substances, with such a pedigree, have not been isolated so far. With these properly identified anaphylatoxins no confusion will be produced, for they will cause a true anaphylaxis, and the usual conception of this process will not be obscured, but, on the contrary, clarified.

This question of the causal relationship between proteid cleavage products obtained in vitro, and the symptoms and signs of true anaphylaxis has been discussed at some length because this view-point of the problem enjoys great favor; because it was necessary to point out that this view as formulated at present leads to confusion, to the useless sacrifice of a well-defined symptom complex and its characteristic anatomical and functional signs, and finally because this view is not the necessary and inevitable consequence of the experimental data at hand.

Other Manifestations of Anaphylaxis. Serum Disease.—The description given so far has dealt exclusively with the experimental analysis of the more important anaphylactic phenomena in lower animals. But similar phenomena occur in man and these have been extensively studied. Opportunity for this study was afforded shortly after therapeutic sera were generally employed to combat disease, especially diphtheria.[2] To v. Pirquet, associated in his earlier work with Schick, we owe the most thorough study of some of the reactions which the human organism may show when injected with various kinds of therapeutic sera. These reactions v. Pirquet and Schick called serum-disease. The development and course of this serum disease is as follows. The *first* injection of a therapeutic serum, usually obtained from an immunized horse, is tolerated by most individuals without any reaction. In those that do react, the symptoms do not develop at once, but after the lapse of eight to ten days. The chief disturbances which now occur are fever, skin eruptions, swelling of the lymph glands near the site of injection, pains in the joints and muscles and edema of the face and dependent portions of the body. In spite of this apparently formidable list of ailments the general condition of the patient is excellent, as a rule, and there is but slight danger.

When the same patient is reinjected after an interval of more than ten days, the picture is somewhat different. The period of incubation is practically absent or at least considerably shortened, and the symp-

[2] It must be stated at once that these undesirable accessory reactions which sera sometimes show in the human being form no contraindication to their employment in proper cases. In severe diphtheria, for example, the antidiphtheritic serum is the only remedy which can save the patient from death; to hesitate in its employment because it may produce more or less severe symptoms itself, would be criminal, as this action might be equivalent to throwing away the only chance of recovery the patient has.

toms either develop after a few hours, the "immediate reaction," or after a few days, the "accelerated reaction." As the time interval between the injections increases the "immediate reaction" no longer appears, but the "accelerated reaction" still occurs and has even been noted when the second injection followed seven years after the first. The symptoms which characterized the "accelerated" reaction are similar to those already described, with this difference that they occur suddenly, and disappear swiftly within approximately a day. The "immediate" reaction is somewhat different and characterized by a local edema at the site of injection which slowly increases and reaches its maximum within about twenty-four hours, and disappears within two to five days. Associated with this local reaction there is high fever, and the skin shows crops of transitory eruptions of varying character. In a small proportion of all cases the immediate reaction shows a grave picture, there is nausea and vomiting, and at times even collapse.

The similarity between serum disease and anaphylaxis was early noted by v. Pirquet and Schick. The specific local edema, for example, is exactly analogous to Arthus's phenomenon in rabbits; the non-fatal collapse cases also are similar to the results which Arthus obtained in rabbits where he noted a strong drop in blood pressure.

There is another class of severe reactions, fortunately rare, which occur suddenly when a patient is injected for the *first* time with serum. The symptoms bear a striking analogy to those observable in lethal anaphylaxis in guinea-pigs and rabbits. Some individuals show a marked respiratory distress of an asthmatic type with cyanosis, similar to guinea-pigs, and others again show symptoms where the respiratory involvement is not so pronounced, but where cardiac weakness predominates. These cases often end in death. Examination of the history of such individuals often shows that they were subject to asthma, or possessed a peculiar idiosyncrasy to the odor of horses which brought on the symptoms of hayfever and asthma. Cases of this kind are probably examples of anaphylaxis in spite of the apparent absence of any sensitizing injection, for this state of sensitization could easily be attributed to inheritance or to a gradual sensitization via the lungs or the stomach. It is well-known, for example, that a sensitized guinea-pig will transmit this property to her offspring, and we may assume that this also plays some rôle in human cases; moreover Rosenau and Anderson have shown that sensitization may be accomplished in guinea-pigs by feeding raw horsemeat, and more recently Rosenau and Amoss reported that they were able to sensitize guinea-pigs for human serum by injecting the infinitesimal amount of organic material found in the expired breath of human beings. These experimental facts render it quite probable that all these cases where the first injection of horse serum produced alarming symptoms or even death, were sensitized in

one of the ways mentioned to this proteid. It is interesting that those individuals which recover are in a state of anti-anaphylaxis for some time afterwards, that is, they are temporarily free from attacks of asthma or hayfever, from which they suffered before.

Local Reactions of Anaphylaxis.—In 1890 Robert Koch announced that the injection of tuberculin produced a local and general reaction in tuberculous guinea-pigs, which, he said, led to an arrest of the tuberculous process and even to health. Everbody probably remembers the sensation which this statement caused. Unhappily, however, the results obtained later in clinical tests did not fulfil expectations. Nevertheless, one important fact remained: the important diagnostic value of the febrile reaction which follows the injection of tuberculin in the tuberculous individual. This reaction occurs only in subjects which are tuberculous, in other words in those who are sensitized by the proteids of the tubercle bacillus; the reaction is thus one of anaphylaxis.

The original method of injecting tuberculin was not devoid of danger, nor was it at best very agreeable to the individual with a positive reaction. In 1907 v. Pirquet described a cutaneous reaction in tuberculosis which gives accurate results and is devoid of any danger or marked discomfort to the patient. v. Pirquet noted that a very small quantity of tuberculin applied to a local scarification of the skin produced within forty-eight hours a well-marked inflammatory reaction in tuberculous subjects, which did not appear in normal individuals. This inflammatory reaction in an individual shows that he must have been sensitized by the tubercle bacillus, in other words that a tuberculous process is in existence somewhere in the organism. The value of this fact is obvious, for it gives a warning, which if properly heeded may prevent invalidism and death.

A reaction similar to that just described is the ophthalmo-reaction of Wolff-Eisner and of Calmette. Instead of letting absorption take place from the skin these investigators instilled the tuberculin in the conjunctival sac of the eye. In tuberculous subjects a quite violent reaction follows; because of this violent response the ophthalmo-reaction has fallen into disrepute.

Phenomenon of Arthus.—The appearance of a local, massive edema and even necrosis at the site of an injection of serum in a sensitized rabbit was first noted by Arthus in 1903 and has been described before in these pages. In was the first example of a definitely recognized, experimental, local anaphylaxis.

Hayfever.—The most annoying and widespread manifestation of local anaphylaxis is hayfever. Many thousands of people suffer from it in the United States alone. In this country we have two disease periods, the so-called "spring or June cold" prevailing in June and July, and the "autumn catarrh" which begins at the end of July and lasts to October. The majority of hayfever patients suffer during the

latter period, and it is quite exceptional that one individual is afflicted during both periods.

The first attack usually begins near the age of puberty and then recurs every year with such regularity that patients are able to forecast quite accurately the date of their coming illness. The duration of the sickness is approximately six weeks.

The symptoms are those of a catarrhal condition of the mucous membrane of the eyes, nose, pharynx and often of the trachea and bronchi. After a preliminary period of one to two weeks, during which there is a moderate irritation of the eyes and nose, associated with a slight discharge, the disease may reach its maximum within a few days or even hours. At this time the eyes are reddened and swollen, and tear secretion is abundant; the nasal mucous membranes are swollen and injected, causing a copious, watery discharge. In addition there are violent, explosive fits of sneezing together with an intolerable itching, and later a soreness of the nose and the eyes. Subsequently nasal breathing becomes impossible and mouth breathing is necessary. Then irritation symptoms of the larynx, trachea and bronchi develop as shown by attacks of coughing. The lung symptoms vary between a mild bronchitis and a severe asthma.

All these symptoms which make life a burden to the hayfever sufferer are caused by the inhalation of certain pollens. As early as 1831 Elliotson advanced this opinion, and later experimental researches by Blackley and especially by Dunbar placed the theory on a safe footing. Dunbar proved that the albumen fraction of certain pollens was the toxic agent by injecting or instilling this substance in predisposed individuals; under proper conditions the typical symptoms were always obtained. The reaction was specific; thus autumn catarrh patients responded typically to the proteids obtained from ragweed and golden-rod, but showed no effect when the pollen proteid of graminaceous plants was used.

Hayfever patients therefore have acquired in some fashion or another a hypersentiveness to the albumin constituent of certain pollens. When plants bearing these pollens are in bloom, the pollen is distributed by the wind, and when inhaled by susceptible individuals, the typical consequences follow. The specificity of the sensitization explains why some suffer in the spring, when pollen from the flowering grasses is in the air, while others suffer in autumn when golden-rod and ragweed distribute their pollen.

Dunbar has produced a therapeutic serum by inoculating horses with the chief pollen proteids which come into consideration. This pollantin has yielded good results when used prophylactically.

Drug Idiosyncrasies.—There are numerous individuals who react with more or less severe symptoms to drugs which cause no obvious effects in the large majority of people. Among these drugs morphine,

quinine, antipyrine and the iodides may be mentioned. While the history of these cases shows a marked resemblance to anaphylaxis, there is, for most of them, no very definite experimental basis. Friedberger has recently obtained anaphylactic symptoms in guinea-pigs sensitized with an iodine-proteid compound. It would be of theoretical importance if true anaphylaxis could be experimentally produced with these substances, because they are of a non-proteid nature.

Food Idiosyncrasies.—Probably everybody is familiar with the fact that certain foods, harmless for most people, cause marked trouble in others. Certain individuals, for example, react to the ingestion of strawberries, buckwheat, clams, eggs, etc., as if a poison had been swallowed. These cases also are probably anaphylactic, but here again the experimental test is lacking to clinch the relationship between these phenomena.

Treatment of Anaphylaxis.—The treatment is not yet in a satisfactory state, but there are a number of remedies available for some of the manifestations of this protean complex. If an injection of horse serum produces respiratory symptoms of an asthmatic type in a patient, the only rational treatment is the administration of atropin, for the investigations of Auer and Lewis have shown that this asthma is due to a tetanic contraction of the finer bronchioles which hinders or prevents the entrance and exit of air in the lungs, and atropin causes a relaxation of these muscles. In a study of the prophylactic value of atropin injections in guinea-pigs, Auer was able to save 72 per cent. of his animals, while 75 per cent. of the untreated controls promptly died. These results have been corroborated by a number of observers, especially by Biedl and Kraus. The negative results which Friedberger and Mita obtained are probably due to the inadequate dose of the atropin which they administered.

If the injection of the serum, however, causes symptoms of cardiac failure with slight symptoms of asthma, there is no treatment founded on experiment. The treatment must be symptomatic only; but one class of drugs must be avoided. Auer has shown in highly sensitized rabbits that drugs of the digitalis group should not be used, because they hasten the fatal outcome by aiding the production of the same cardiac lesion which anaphylaxis itself calls forth. Moreover, the same observer has recently described changes in the cardiac muscle produced by members of the digitalis group, especially strophanthin, which are very similar to those produced in cardiac anaphylaxis. It is, therefore, clear why these cardiac stimulants must not be given, even though the weak heart would seem to demand their exhibition.

The most rational treatment is the preventive one. The utmost precaution should be observed whenever it become necessary to inject a therapeutic serum in a patient who has been injected with serum before, who is subject to asthma, hayfever, or who shows an idiosyncrasy to

horses. The best treatment of this kind, in my opinion, is the vaccination procedure of Besredka. In this method a very small quantity of horse serum is given subcutaneously or even rectally and time allowed for its absorption. The amount absorbed at any time will be too small to cause serious symptoms and yet enough to produce anti-anaphylaxis. After anti-anaphylaxis has been established, and this occurs quite rapidly, the full dose may be given subcutaneously with some safety. The only objection to this procedure is that time, an hour or two, is lost. The time could be shortened probably, though at some risk. Besredka has obtained good results with the method in guinea-pigs, and it should receive a full clinical trial.

Friedberger and Mita have recently described another method by means of which they were able to protect guinea-pigs against ten times the fatal dose. This result was obtained by a slow intravenous infusion of serum so that only traces enter the circulation at one time. The time of infusion lasted fifty to sixty minutes in their experiments. It will be observed that the same principle used by Besredka, the production of anti-anaphylaxis, is here also utilized.

The treatment for hayfever has already been mentioned.

Importance of Anaphylaxis.—The phenomena of anaphylaxis which have been briefly discussed in the preceding pages are important because they have given us a deeper insight into certain interesting diseases, the so-called idiosyncrasies or predispositions whose causation was formerly inexplicable. The remarkable fact is now established that an organism may be so altered by the injection of an apparently perfectly harmless proteid, that a subsequent injection of the same proteid acts like a violent poison. Predisposition of an individual to any substance means now that this individual is sensitized to this substance. How this sensitization has been accomplished is still undecided in many instances, but the basic conceptions of anaphylaxis will be a safe guide in solving the problem.

It must be emphatically pointed out that the analysis of anaphylactic phenomena would have been impossible without animal experimentation; the chief advances have been made by the functional investigation of these disturbances in laboratory animals and not by tissue examination after death. Thus the autopsies of those early unfortunate cases where death resulted from the administration of a therapeutic serum, yielded no information whatsoever regarding the cause of exitus. The physicians stood before a riddle, the more terrible because its nature was unknown. Animal experimentation has explained this fatal enigma, partially at least, and the physician no longer stands in helpless ignorance before it. He knows the state now, and some methods to prevent or reduce its dangers have been placed at his disposal which promise a fair success.

THE PERMANENCE OF INTERESTS AND THEIR RELATION TO ABILITIES

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THERE is a wide range of opinion amongst both theorists and practitioners with respect to the importance of the interests of children and young people. These early likes and dislikes, attractions and repulsions, are, by some, taken to be prime symptoms of what is for the welfare of the individual or even of the species. By others they are discarded as trivial, fickle, products of more or less adventitious circumstances, meaning little or nothing for the nature or welfare of any one. It seems, therefore, desirable to report whatever impersonal estimates of the significance and value of interests one can secure.

I have measured the significance of interests in certain limited particulars, with very definite results, and shall, in this article, describe these results and the method by which they were obtained and by which any one can readily verify them.

The particular problems attacked all concerned the *relative* amount or *relative* intensity or *relative* strength of interests *within the same individual.* That is, "greater interest" will always mean the interest which was greater than the others possessed by the same individual. Little interest will mean little in comparison with the individual's other interests. The question, "To what extent is the strength of an interest from ten to fourteen prophetic of the strength which that interest will manifest in adult life?" will mean, "To what extent will it in adult life keep the same place in an order of the individual's interests which it had in the order which described his childish preferences?" Amounts or degrees of ability or capacity will similarly always mean *relative* amounts. Thus, to say that a person was, during high school, most interested in mathematics and most able at mathematics will mean that the person liked mathematics more than *he* did anything else, and did better at mathematics than *he* did at anything else. The statement will not imply anything about the degree of his interest or ability in comparison with other individuals.

The particular problems attacked are limited further to seven varieties of interests and the corresponding varieties of ability or capacity, namely, mathematics, history, literature, science, music, drawing, and other hand-work (this last being defined as "carpentering, sewing,

gardening, cooking, carving, etc."). All comparisons or relations of interests and abilities are within this group, so that, for example, the statement that John Doe had interests in the high-school period distributed in the same order of strength as in the elementary-school period will mean that these seven interests had the same order in the two periods.

Such being the meanings of terms and the limitations of the field of inquiry I have measured:

1. The permanence of interests from the last three years of the elementary-school period to the junior year of college or professional school.

2. The correlation or correspondence between interests in a given subject and ability therein at the elementary-school period.

3. The same relation at the high-school period.

4. The same relation toward the end of the college or professional course.

5. The same relation on the whole (this will be explained later).

6. The correlation or correspondence between *interest* in a given subject at the end of the *elementary-school* period (during its last three years) and *ability* in that subject toward the end of the *college* or professional-school period.

The results to be here reported are for one hundred individuals, juniors in Barnard College, Columbia College and Teachers College. These results are corroborated by a similar but less minute study of two hundred other individuals.

The original measures are the judgments of the hundred individuals themselves concerning the order of their interests in mathematics, history, literature and the rest, at each of the three periods. Each individual reported in writing in response to the following instructions:

EXPERIMENT 34. (TABLE 1)

Consider your interests in the activities listed below during the last three years of your attendance at the elementary school. Mark (under El. Interest) with a 1 the activity which at that period was to you the most interesting of the seven listed. Mark the one that was next most interesting, 2; and so on.

Record similarly (under H. S. Interest) the order of interest for you during the high school period. Record similarly (under Col. Interest) the order of interest for you now.

Pay no attention at present to the spaces under ability.

Later he reported similarly his judgment as to his relative ability in each of these seven lines of activity in response to the following instructions:

TABLE 1

	In Last Three Years of Elementary School		In High School		In College	
	El. Interest	El. Ability	H. S. Interest	H. S. Ability	C. Interest	C. Ability
Mathematics						
History						
Literature						
Science						
Music						
Drawing						
Other hand work[1]						

EXPERIMENT 35

Consider your ability in each of the activities listed in Table 1, as it existed during the last three years of your attendance on the elementary school. Rank the activities from 1 to 7 according to your ability in each, marking that activity in which you had most ability 1. Record your ranks under the column headed El. Ability in Table 1. Record similarly (under H. S. Ability) the order of ability for you during the H. S. period. Record similarly (under C. Ability) the order of ability for you now.

We have then for each of the hundred a record such as is shown in the case of one of them in Table 2. These data are obviously subject to

TABLE 2

	In Last Three Years of Elementary School		In High School		In College	
	El. Interest	El. Ability	H. S. Interest	H. S. Ability	C. Interest	C. Ability
Mathematics	3	3	3	2	4	2
History	1	1	4	3	1	1
Literature	2	2	2	1	2	3
Science	4	4	1	4	3	4
Music	5	5	7	5	5	7
Drawing	6	6	5	7	6	5
Other hand-work	7	7	6	6	7	6

certain errors of memory, prejudice, carelessness and the like, which will, later, be given due attention. It will be best to consider first what the meaning of the records would be, were each number a perfectly true statement of the relative strength of the interest or ability in question.

Consider then this sample record as perfectly true and compute from it the differences between each subject's position for interest in the last three years of the elementary-school period (column 1) and for the high-school period (column 3).

[1] Other hand work means carpentering, sewing, gardening, cooking, carving, etc.

We have:

Mathematics	0
History	3
Literature	0
Science	3
Music	2
Drawing	1
Other hand-work	1
Sum of the seven differences	10

These facts are repeated in the first column of Table 3.

TABLE 3

	I Difference Between El. Interest Rank and H. S. Interest Rank	II Difference Between El. Interest Rank and C. Interest Rank	III Difference Between H. S. Interest Rank and C. Interest Rank
Mathematics	0	1	1
History	3	0	3
Literature	0	0	0
Science	3	1	2
Music	2	0	2
Drawing	1	0	1
Other hand-work	1	0	1
	10	2	10

Computing the other differences as shown in the second and third column of Table 3, we have for this individual the means of answering question 1, concerning the permanence of interests. If the individual had remained unchanged in his interests from any one period to any other the appropriate seven differences of Table 3 would obviously have been all zeros and the sum of that column would have been zero. If, on the other hand, he had from one to another period, changed as completely as possible, the sum of the appropriate column of Table 3 would have been 24 (7–1, 6–2, 5–3, 4–4, 3–5, 2–6, 1–7 giving 24). If the individual's interests had been due to mere caprice, changing their relative strength at random, the sum of any column of Table 3 would approximate 16. For, if a 1 is equally likely to become a 1, 2, 3, 4, 5, 6 or 7, and so also of a 2, a 3, a 4, etc., the average result will be 16.[2]

Any quantity below 16 as the sum of a column then means some permanence of interests in the individual in question, and the degree of permanence is measured by the divergence from 16 toward 0.

For the permanence from the elementary-school period to the junior

[2] 1 becoming 1, 2, 3, 4, 5, 6, 7 gives as differences 0, 1, 2, 3, 4, 5, 6;
2 becoming 1, 2, 3, 4, 5, 6, 7 gives as differences 1, 0, 1, 2, 3, 4, 5;
3 becoming 1, 2, 3, 4, 5, 6, 7 gives as differences 2, 1, 0, 1, 2, 3, 4.
Continuing and dividing the sum of the 49 differences by 49 we get 2 2/7 for the average difference by mere chance shifting and $7 \times 2\ 2/7$ or 16, as the average sum of a column in Table 3 by mere chance shifting.

year of college or professional school in my hundred individuals this figure is, on the average 9, three fifths of the individuals showing sums of from 6 to 12 for column 2 of Table 3. This average result of 9 may be expressed as a coefficient of correlation or correspondence, such as is in customary use to measure resemblances of various sorts. It is equivalent to a correlation of over .60. This means that a person's interests in the late elementary-school period resemble, in their order and relative strength, the constitution of interests which he will have eight years later to the extent of six tenths of perfect resemblance. For the coefficient of correlation is a magnitude running from — 1.0, which would be the coefficient if the sum of differences was 24, through 0, which would correspond to a sum of differences of 16, to + 1.0, which would correspond to a sum of differences of 0. A sum of differences of 8 means a resemblance greater than half of perfect resemblance, as the reader expert in the mathematics of probability will realize. The sums 12, 10, 8 and 6, in fact, mean coefficients of resemblance or correlation of + .38, + .55 + .71, and + .83, respectively.

The effect which the errors to which the original reports are subject would have in making this obtained degree of permanence too high or too low may now be considered. The chance errors—the mere failures of memory or carelessness in report or inability to distinguish slight differences in the interest of nearly equally interesting subjects—would make the obtained estimate *too low*. Their action would be to change the true sum of differences, whatever it was, toward 16, or the true coefficient of correlation toward zero. The effect of errors of prejudice, on the other hand, might have been toward so distorting memory and observation as to make the order given for interests in the two later periods more like the order given for the elementary-school period than was in truth the case. This would, of course, unduly raise the obtained estimate of permanence (that is, lower the sum of the differences). I do not believe that such tendencies to read present interests into the past and to leave the order reported for one period unchanged so far as possible, are very strong, there being a contrary tendency to remember and look for *differences*. On the whole, I should expect the effect of the large chance errors in *lowering* the estimate of permanence to nearly or quite counteract whatever balance of prejudice there may be in favor of similarity of interests or projection of present conditions into the past.

A correlation of .6 or .7 seems then to be approximately the true degree of resemblance between the relative degree of an interest in a child of from ten to fourteen and in the same person at twenty-one.

Consider now the difference between a subject's rank for interest and its rank for ability at the same period. Using the same sample record (Table 2) and assuming it to be a true record of the order of interests

and computing from it the difference between each subject's position for interest in the elementary-school period (column 1) and its position for ability in the same period (column 2), we have:

Mathematics	0
History	0
Literature	0
Science	0
Music	0
Drawing	0
Other hand work	0

These facts are repeated in the first column of Table 4. Similar facts for this same individual, for the differences between the order for interest and the order for ability in the high-school period and in the college period are given in the second and third columns of Table 4.

TABLE 4

	I Differences Between El. Interest and El. Ability	II Differences Between H. S. Interest and H. S. Ability	III Differences Between C. Interest and C. Ability
Mathematics	0	1	2
History	0	1	0
Literature	0	1	1
Science	0	3	1
Music	0	2	2
Drawing	0	2	1
Other hand-work	0	0	1

If at any period an individual has greatest ability in the subject which is most interesting to him, next greatest ability in the next most interesting subject, and so on, the sum of the seven differences for that period will be zero. If the order of ability was as unlike as possible to the order of interest this sum would be 24, and if the relation between interest and ability was that of mere chance this sum would be 16. Any quantity below 16 as the sum of a column in Table 4 then means some positive relation or resemblance between the individual's degrees of interest and his degrees of ability.

For the hundred individuals studied this figure is on the average approximately 5, being practically the same for the elementary-school period, for the high-school period and for the college period. This average result may be expressed as a coefficient of correlation of .88. Nearly three fourths of the individuals show records between 2 and 8, inclusive—that is, correlations of from .70 to .98.

If, in the case of any individual, we add together the three ranks for each subject in interest at the three periods and do likewise for its ability-ranks, we have measures of the general order of the seven subjects

for interest and for ability over the whole period from, say, the age of eleven to the age of twenty-one. Thus, in the sample chosen, the combined ranks give:

	Sum of Ranks for Interest, All Three Periods	Sum of Ranks for Ability, All Three Periods
Mathematics	10	7
History	6	5
Literature	6	6
Science	8	12
Music	17	17
Drawing	17	18
Other hand-work	20	19

Turning these into positions from 1 to 7, we have:

	General Rank for Interest	General Rank for Ability
Mathematics	4	3
History	1½	1
Literature	1½	2
Science	3	4
Music	5½	5
Drawing	5½	6
Other hand-work	7	7

The differences in the order are then 1, ½, ½, 1, ½, ½ and 0, their sum being 4.

I have made the calculation for each of the hundred individuals. On the average this sum of differences is approximately 4½, and corresponds to a coefficient of correlation of .91. The individual whose interests follow his capacities least closely still shows a substantial resemblance (nearly .5). The correlation between an individual's order of subjects for interest and his order for ability is in fact one of the closest of any that are known. A person's relative interests are an extraordinarily accurate symptom of his relative capacities.

The effect which the errors to which the original reports are subject is on the whole probably to make this obtained degree of resemblance between interest and capacity too *low*. Errors due to accident, carelessness, and inability to distinguish or to remember slight differences in interest or in capacity, would make the sums of difference in the long run greater—and the degree of resemblance obtained, less—than the true facts, would have given. The only sort of error that could make the obtained resemblance *greater* than the true fact would be an error whereby either order was falsified to make it more like the other, notably, the possible tendency to rate oneself higher than one should for ability in a subject which one likes. On the whole, the resemblance

between interest and ability may safely be placed at about .9 of perfect resemblance.

I have computed the resemblance between *interest in the last three years of the elementary* school and *capacity in the college period* as a partial measure of the extent to which early interest could be used as a symptom of adult capacity. The average for the hundred individuals is a coefficient of correlation or resemblance of .60.

I have also, for comparison with the last measurement and with the measurement of the resemblance of interest in the late elementary period to interest in the college period, computed the coefficient of correlation or resemblance between the order of the seven subjects for *ability* in the elementary and their order for *ability* in the college period, using the records from these same hundred individuals. The average resemblance obtained is six and a half tenths, or slightly closer than that for early and late interest.

These facts unanimously witness to the importance of early interests. They are shown to be far from fickle and evanescent. On the contrary, the order of interests at twenty shows six tenths of perfect resemblance to the order from eleven to fourteen, and has changed therefrom little more than the order of abilities has changed. It would indeed be hard to find any feature of a human being which was a much more permanent fact of his nature than his relative degrees of interest in different lines of thought and action.

Interests are also shown to be symptomatic, to a very great extent, of present and future capacity or ability. Either because one likes what he can do well, or because one gives zeal and effort to what he likes, or because interest and ability are both symptoms of some fundamental feature of the individual's original nature, or because of the combined action of all three of these factors, interest and ability are bound very closely together. The bond is so close that either may be used as a symptom for the other almost as well as for itself.

The importance of these facts for the whole field of practise with respect to early diagnosis, vocational guidance, the work of social secretaries, deans, advisers and others who direct students' choices of schools, studies and careers, is obvious. They should be taken account of in such practise until they are verified, or modified by data obtained by a better method: and such data should be soon collected. The better method is, of course, to get the measurements of relative interest and of relative ability, not from memory, but at the time; and not from individuals' reports alone, but by objective tests. Such an investigation requires a repeated survey of each individual at three or more periods, say in 1912, 1915 and 1920, and demands skill and pertinacity in keeping track of the hundred or more children and arranging for the second and third series of reports and tests. I hope that some one of my readers will be moved to undertake it.

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CHINA'S GREAT PROBLEM

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NEITHER the institution of republican forms of government, nor the creation of a spirit of natural unity, not even the inculcation of republican ideals constitutes China's great and imminent problem. It is not inappropriate that a nation whose people are best known for their skill and probity in business affairs, at the close of revolution engendered in large part by financial considerations and brought to a speedy termination by that modern arbiter of warring factions and nations, the international money lender, should find her most imminent and pressing problem a plain one of business. The average man finds it necessary to give constant consideration to the relation between his income and expenditures and to possible sources of increase of the one and diminution of the other. Nations are no more fortunate and China is unusual only in that her monetary affairs, through her international loans, have become matters of cosmopolitan importance.

At the beginning of last year China had a total foreign indebtedness, secured by Imperial revenue, of approximately $700,000,000,[1] corresponding to an annual interest charge of approximately $35,000,000. During the year a budget was prepared, the first in the history of the nation, which showed that the estimated annual income of the empire was some $180,000,000. The budget made evident to all what many had long known, that China was unable to make both ends meet, and like a spendthrift was using her capital to pay her debts. The fundamental causes of the revolution of 1911 have been much obscured by the natural human desire to weave adventure and romance into war, but it is true, nevertheless, that just as the "embattled farmers" were irritated beyond bearing by a tax on tea, so were the "sons of Han" roused to arms by burdening them with a foreign loan of which they did not approve.

It will be remembered that after the American financiers who had acquired a concession to build a railway from Hankow to Canton perfidiously sold it to the Belgian interests, whom the Chinese especially wished not to secure it, the concession was bought back by China and the people of the provinces through which the road passed attempted to

[1] Only approximate figures can be given, for the varying rates of exchange and diverse rates of interest make exact figures impossible.

raise the funds for its construction. Considerable sums were raised, but were neither wisely managed nor well spent, and as time passed the funds gradually melted away without any material return in the form of roadbed and rolling-stock. Meanwhile, centralization of power in the Peking government was increasing with rapid strides, and finally the Peking authorities began to negotiate with England, France and Germany a loan for the construction of this and other railways. The means by which the United States claimed and secured the right of participation in this loan, while of importance to China as well as the banker powers, is outside the present question. It was evident from the first that there was great popular opposition to the loan, and foreigners, who knew the popular temper, prophesied that it could never be consummated. Finally the negotiations were concluded, however, and the terms were announced. Among other provisions it was announced that for the sum already spent by the people of the provinces, stock in the railway enterprises to half its par value would be allotted. The pot of revolution, which is always seething in southern China, at once boiled over. The Chinese people had suffered an incompetent government by alien officials as long as it did not greatly trouble them. When it began to waste their money they promptly revolted.

It is generally agreed that war is hell. It is also expensive. Bombardments, bloody combats, fire and looting figure in the head-lines of the daily journals, but the real work of the revolution was done in the financial council chamber. At the beginning of the outbreak neither side was provided with adequate funds, for the revolutionists were unable to secure any considerable sums, though able to cut off a large part of the normal income of the Peking government, and the imperial household with business caution refused to give up their store of private treasure for what bade fair to be a losing contest. The struggle at once resolved itself, therefore, into a competition to secure foreign financial assistance.

Perhaps some day the true history of the negotiations at Peking and Nanking will be made known. But from a business standpoint it was at once evident that the Peking government had immensely the more advantageous position. It had for some time been in negotiation with representatives of the banker nations in regard to loans, and was easily able to continue its negotiations. Bankers seek for stability and naturally preferred to deal with a government whose peculiarities had been learned through years of experience, rather than to take a chance with an oriental republic, of which it would be safe only to prophesy that it would do the unexpected. The revolutionists were out of touch with the financiers, many of them were young and inexperienced, and they were unable to make any impression except upon the Japanese and Russians, who hoped that after a new deal in China they might hold a better hand.

The Chinese are an eminently reasonable people; their natural motto is to suit themselves to circumstances. When it became clear that the revolutionists could not secure funds to put themselves in control of the country, and that the Peking government, while it could secure funds upon evidencing an ability to tranquillize the country, could not do so as long as the Manchus remained in nominal control, the inevitable followed. The Manchu emperor and his associates gracefully abdicated, announcing that the will of Heaven, speaking through the voice of the people, desired the institution of a republican form of government, and the revolution was *fait accompli.*

In the months which have since elapsed China has been crowded from the stage of international attention by other affairs, yet the negotiations which have been going on are of even greater importance than the more spectacular events of the war. The banker powers are good business men, and, having an opportunity to make China "pay through the nose," were not unlikely to underestimate it. The Chinese are business men, too, and struggled to secure as favorable terms as possible. The difficulty was a complex one—China wished to avoid Egyptianization, while the powers wished to be sure that their money would be well spent, and reasonably secure, while inextricably interwoven were the political aspects of the loan. The Chinese played their ancient game of pitting one interest against another. Many loans were proposed, a loan of $30,000,000 from Baron Cottu was seriously considered, and part of an Anglo-Belgian loan was paid over. The four powers which had been in negotiation for the past two years were increased to six by the addition of Russia and Japan, and finally to seven by the addition of Austria before it was agreed that all other loans should be abandoned and $300,000,000 advanced to China by this septuple syndicate in a series of instalments.*

The problem has not been solved, however; only expanded. Soon China will be indebted to foreign nations by nearly $1,100,000,000, a greater sum than the national debt of the United States. This calls for an annual interest payment of over $50,000,000, over and above the expenses of government. Her total annual income has so far apparently been about $180,000,000 or about one fourth that of the United States. In other words, to an already large annual deficit she has added an annual interest charge of over $15,000,000. Can she increase her income to meet it? A corporation in such a precarious situation would procure the services of the ablest business manager whom money could secure. China's problems are fit tasks for supermen; will the supermen be forthcoming?

* Since this article was written the republican government has refused to accept this loan on the terms proposed. The fundamental problem means essentially the same.

A brief survey of China's economic condition will be of service. In former times China was like a "balance-tank" in an aquarium, self-supporting. As Ross has recently accurately remarked, the nation is an exemplification of the law of Malthus, the balance between population and means of existence. To us of America a true mental picture of the economic status of the Chinese is almost an impossibility. A comparison may serve, and by pointing out that the present degree of comfort and convenience enjoyed by the average Chinese demands a coal production 1/175 of that in the United States, and until recently an iron and steel production only 1/1,200 that of the United States, it may be more clear that the Chinese nation as a whole is close to the margin of mere existence. The problem with the average Chinese is an elemental one; enough food to preserve life and enough clothes to keep warm and subserve modesty. China's present unenviable position is not unlikely largely due to the fact that when international trade developed and the export of tea began to meet the import of the ubiquitious blue cotton cloth that forms the Chinese national dress, the acreage formerly devoted to the cultivation of cotton was sown to the opium poppy and the national wealth vanished in curls of smoke that wafted away at once the substance and virility of the people.

Now the use of opium is almost suppressed, soon will be completely so, and the land devoted to its cultivation, will be sown to grain, sugar beets and other crops of real value. The problem is still an elemental one, however. It is idle to simply point out that by opening mines, building railways and developing manufacturing industries, the scale of living of the Chinese citizen can be raised to approximately as luxurious a plane as in the United States. The real question is—will the increase in the wage of the average citizen bring him increased comfort and convenience, or will it bring a few more mouths to feed and another approximation to the margin of existence? If the latter, the Chinese expression for the management of a household—"Kuo jih-tze" to get over the day—will remain always, as now, the index of national economy. Upon the answer to this question hangs China's future.

The further elaboration of this topic would take me into a field in which I scarcely dare venture. It is still a subject of discussion in this country whether the restriction of the size of families is compatible with good morals and good economics. Apparently the pragmatic answer is in the affirmative. The great desire of the Chinese parent for offspring to maintain the rites of ancestral worship further complicates an already complex problem and I will leave it in abeyance, in order to discuss the problem of securing national prosperity from the standpoint of the scanty facts available.

Of China's present foreign indebtedness nearly $350,000,000 represents indemnities, largely the outcome of the outbreak of 1900. The

remainder has partly been invested in railway and other industrial enterprises, and partly used in a variety of minor ways. To meet the interest and principal upon this debt the returns of the Maritime Customs has been the security, and the service has for years been under foreign direction. Besides being a source of income the custom service has been an object lesson and a training school for the Chinese. Out of it has grown the excellent postal, telegraph, and telephone service which China enjoys. In 1905 35,110,000 taels[2] were collected from the import and export tax on merchandise. In the budget recently published in the Chinese press, following the address given by President Yuan before the National Assembly, the expected receipts from the Maritime Customs this year is given as 35,140,000 taels. The growth is inconsiderable while the fluctuations in exchange during the past year correspond to a difference of about 5,000,000 taels in the conversion of this sum into gold.

Consideration of this budget as a whole offers an interesting study and I therefore give the estimated revenues and expenditures under the new government, as printed in Chinese journals, and translated by the well-informed *National Review* of Shanghai.

ESTIMATED REVENUE

Ordinary

Land Taxes	46,164,709
Salt and Sea	46,312,355
Maritime Customs	35,139,917
Native	6,990,845
Sundry Duties	36,136,842
Likin	43,187,907
Income from Official property	36,600,899
Sundry Receipts	19,194,101
Total	Tls. 269,754,579

Provisional

Land Taxes	1,936,636
Native Customs	8,524
Contributions	5,652,333
Government Credit Notes	3,560,000
Sundry Receipts	16,050,648
Total	Tls. 27,208,142
Grand Total	Tls. 296,862,721

[2] The tael is a Chinese ounce of silver, and has different values at different places. The customs tael = 1.0164 Kuping tael. The latter is 575.8 grains of pure silver, and is doubtless the tael used in the budget. Naturally, its value in gold varies according to the rate of exchange.

ESTIMATED EXPENDITURE

Ordinary Expenditure

Executive Affairs	26,069,666
Foreign Affairs	3,375,130
Interior Affairs	19,735,787
Financial	17,703,545
Maritime Customs	5,748,237
Native Customs	1,460,332
Commercial Affairs	745,759
Educational Affairs	12,801,468
Judicial Affairs	6,616,579
Naval and Military Affairs	83,498,811
Industrial Affairs	5,315,606
Communications	48,898,355
Works	2,511,257
Official property	7,696,361
Provincial Indemnities	39,120,732
I. M. Customs Indemnities	11,263,547
Native Customs Indemnities	1,256,491
Territorial	1,239,908
Total ..... Tls.	295,256,882

Provisional Expenditure

Executive Affairs	1,258,184
Foreign	626,177
Financial	2,877,904
I. M. Customs	9,163
Native Customs	40,576
Civil Affairs	2,724,974
Commercial	54,037
Educational	3,348,061
Judicial	218,746
Naval and Military	14,000,540
Industrial	667,154
Communications	7,804,908
Works	2,576,137
National Credit Notes	4,772,613
Total ..... Tls.	40,979,180
Grand Total ..... Tls.	336,236,062

Lest the reader be unduly impressed by the appearance of accuracy given by carrying out these sums to the nearest unit, let me add that the probability of error in them is very great and other published estimates put the expenditure as high as 576,000,000 taels, while the Board of Revenue in 1910 prophesied a deficit of 80,000,000 taels in 1911. The indicated deficit of 40,000,000 taels may therefore be regarded as a fairly optimistic view of the financial situation.

As to expenditure, it is seen that over 50,000,000 taels is required to pay interest on indemnities. Communications (railways, post-office

and telegraphs) consume nearly an equal sum and return only about two thirds as much in the form of revenue, the difference being partly due to expansion and partly to a present lack of profits from many enterprises. Naval and military affairs consume a large sum, but the present temper of the Chinese public is strongly contrary to a reduction of the effort to make China self-protecting. Educational expenditures should be increased, rather than curtailed, and it may similarly be said of most of the other items that though the moneys might perhaps be more wisely and efficiently expended they can not very well be decreased if the country is to prosper. China's hope lies, not in decreasing her expenses, but in increasing her income.

To greatly increase the income from the Maritime Customs scarcely seems feasible. The present rate of 5 per cent., imposed equally on imports and exports, is certainly low, but the commercial treaties existing with the principal countries only provide for a moderate increase, and it scarcely seems possible that the banker nations would look with favor upon a proposal to tax foreign trade in order to secure income to meet the interest upon their loans. The likin (internal transit tax) should be abolished; like the ridiculous prohibition of the export of grain from one province to another, it hangs like a vampire on the industrial body of the nation, sucking out its life. The conception that certain parts of the country are best suited to the production of certain commodities, while others can best produce something else, and that the best interests of the whole are secured by offering every facility for the free exchange of products, is so elementary that it is strange that even such pronounced individualists as the Chinese have not earlier perceived it. The salt gabelle, similarly, is a financial anachronism. The income from the government-owned enterprises can be greatly increased by better, more intelligent, more careful, and more honest management. In fairness it should be said that the lack of profits from these is not all to be laid at the door of the Chinese; foreign engineers have built $40,000,000 railroads where the probable trade only justified a $10,000,000 road, and foreign supervision of enterprises has often brought with it fat contracts for the foreign merchant.

The land tax might be increased, but the farming class, the large landowners, are already barely above the margin of subsistence, as a whole. But by development of agriculture, as in the United States, the income of the farming class could be greatly increased, with a corresponding taxable margin. Agriculture is the fundamental industry of any country, and the new government will be stupidly negligent if it does not make provision for its scientific development. Progress has already been made in this regard in Manchuria. The improvement of yield and of product by the judicious selection of seed is an idea which has never occurred to the Chinese; indeed, it may be broadly said that

the improvement of anything by the elimination of its bad features and increasing of its excellences has never characterized Chinese industrial activity in recent times. I think it unquestionable that the people of China can be better fed and made correspondingly more vigorous simply by government aid to agriculture and the allowing of the free transit of the products of one part of the empire to any other part. The productive energy of the nation as a whole can thus be immensely increased. The human body is an engine for the conversion of food into useful work. Like any other engine, if it is supplied with only enough power to keep it going the useful output is small, since nearly all is used up in driving the machine. But give it all the power it can economically use and the useful output is many-fold greater. The simile is a crude one, but none the less accurate.

It will be noticed that no provision is made for the taxing of incomes, or of industrial enterprises. Under the old system either the tax on land or the tax on trade reached nearly all of these. This is no longer the case and such companies as Standard Oil, British-American Tobacco, Singer Sewing Machine, and numerous native enterprises carry on a large trade without being subject to any tax. This will constantly increase, and by the imposition of a just tax on these new forms of industry considerable sums can be derived. Every means should be taken to encourage the development of such enterprises. The mineral resources of China should be studied and mapped by qualified engineers, the country should be mapped topographically as an aid to the development of railway, irrigation and industrial enterprises, and every effort should be made to increase the agricultural and mineral productivity. A well-fed people with material to work with can upbuild China into a nation of solid wealth and substance. But if the proceeds of the new loan are expended unwisely and unprofitably then China must inevitably within a few years become another Persia. Business principles, rather than political considerations, must be preeminent in the conduct of the new government.

MODERN WARFARE AGAINST GRASSHOPPERS

By Professor F. L. WASHBURN

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IN all probability there will never be in the middle west a repetition of such uneasiness and alarm as prevailed during the early seventies in the states of the upper Mississippi and Missouri valleys, on account of the so-called Rocky Mountain grasshopper, *Melanoplus* (*Caloptenus*) *spretus*. Entomologists living in the area bounded by the Rockies on the west and the Mississippi Valley on the east report that for many years they have been unable to collect a baker's dozen of this long-winged locust east of the western plains, which represent occasional breeding grounds of this at one time destructive species, or in the foothills of the Rockies, believed to be the source and permanent breeding grounds of the pest, although it is reported that a few individuals have recently been captured in the Rocky Mountain districts. The passing of this insect may be in slight part due to the settling up of much of the country formerly utilized by them as breeding grounds, either temporarily or permanently. But so suddenly has it disappeared, and so markedly has been the increase of an allied shorter-winged form, *M. atlanis* (the lesser migratory locust), closely resembling *M. spretus,* that a suspicion exists that the latter may have been a varietal and, we may say, a sporadic form of the first named. Farmers, however, and others in the region indicated, must rid themselves of the idea that the winged visitor from the Rockies which, years ago, laid waste their fields, is the one grasshopper to be dreaded. Indeed, they are beginning to realize that in the rapid increase of some of our common species, which we may refer to as "native" species, there exists a serious menace to successful farming. Any grasshopper or locust is injurious in proportion to its abundance, and during the last three years a marked increase of a few of our common forms, and the accompanying and yearly increasing injury to crops, constitute a "writing on the wall," as it were, well calculated to rouse citizens from a feeling of absolute security to an appreciation of the need of practical measures of control. This menace is of interest not only to farmers, but naturally also to business men in any community so afflicted, since the business prosperity of a locality depends very largely on the prosperity of the farmers.

The farmer living in a neighborhood under complete cultivation, containing but a small amount of untilled land, has little to fear, but

FIG. 1. TWO-STRIPED LOCUST OR GRASSHOPPER (*Melanoplus bivittatus*), FEMALE.

FIG. 2. TWO-STRIPED LOCUST OR GRASSHOPPER, YOUNG FORM. Representing stage best adapted to be killed by poisonous spray.

FIG. 3. LESSER MIGRATORY LOCUST OR GRASSHOPPER (*M. atlantis*), MALE.

FIG. 4. DIFFERENTIAL LOCUST OR GRASSHOPPER (*M. differentialis*), MALE.

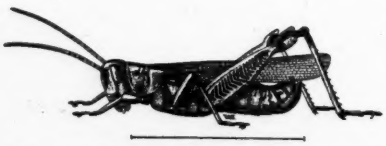

FIG. 5. PELLUCID LOCUST OR GRASSHOPPER (*Camnula pellucida*), MALE.

FIG. 6. THE RED-LEGGED LOCUST OR GRASSHOPPER (*M. femur-rubum*).

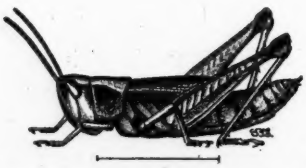

FIG. 7. THE SHORT-WINGED LOCUST OR GRASSHOPPER (*Stenobothrus curtipennis*), MALE.

those endeavoring to raise crops in districts where there are hundreds of acres of virgin land untouched by the plow, or large tracts of "reverted" land, land which though once cropped has been allowed to revert to natural conditions, may well look with apprehension upon the accumulating hordes of what they used to regard as harmless grasshoppers in contradistinction to the much-dreaded Rocky Mountain locust. It is such localities that offer ideal conditions for the increase of this insect. Evidently, therefore, farmers living on the frontier of agricultural areas next to new or reverted land, the pioneer farmers, as it were, are the ones to suffer most heavily. Given such localities and dry weather, the absence of heavy, killing rains, when the young hopper is just out of the egg for a succession of seasons, and the agriculturist sees acres of wheat, oats, rye, barley and flax rendered so nearly worthless that they do not warrant the labor of harvesting. During 1909, 1910 and 1911 several species of grasshoppers have been increasing to such an extent in a number of states in the middle west that special remedial measures have been necessarily sought. A few of these states have created grasshopper laws, aimed at the obligatory destruction of egg clusters in fall or spring by compulsory plowing. These laws, however, are, in most instances, notoriously ineffective, and some practical method or methods of control within the reach of the average farmer had to be discovered. Manifestly, these measures of relief must be such as to enable the individual farmer to protect himself, no matter how unfavorable the conditions surrounding him. It was to solve this problem, as far as lay in his power, that the writer and his staff have applied themselves for two years, and it is believed that we have found a fairly sure means of crop protection if our farmers will follow directions emanating from the Experiment Station. While our experience has been confined necessarily to Minnesota, these remedies are equally applicable in other states, where the same or worse conditions prevail. In fact, we would not convey the impression that Minnesota is a grasshopper-stricken state; far from it, for a very large proportion of our agricultural land, most of it, in fact, is relatively free from this pest, but we seek to protect from loss those individual farmers, pioneer farmers we have called them, who live in the western quarter of the state in the neighborhood of vast tracts of unused lands, property held by speculators, unsalable tracts, acres held by individual farmers who have more land than they can handle, land occasionally rented, and between rentals lying idle, a menace to adjoining properties of industrious citizens doing their best to get a living from the soil. Manifestly fall plowing, thus burying the eggs deeply, will not be of material benefit to these men, for the hungry hordes will pour in upon their tender grain from the adjoining fields, whose owners, not easily reached by our grasshopper laws, are indifferent. True, such a farmer can and

FIG. 8. A HOPPER-DOZER IN ACTION.

does get some relief by the constant use of the old-time "hopper dozer," driving it back and forth over his fields while the grain is young. He may, if there is no hay crop at stake, and at some considerable risk to fences and buildings, burn over fields where myriads of young hoppers are a few days old, if such fields are burnable; and he may successfully, and with considerable profit to himself and family, protect his vegetable garden with a flock of grasshopper devouring turkeys. Yet none of the above measures is sufficient to obtain the results necessary to successfully meet existing conditions, none of them makes a sufficient impression upon the hordes of grain-devouring insects. The exigencies of the case prompted the writer to experiment with a poison spray (arsenite of soda) found successful in South Africa. Our legislature of 1910–11, influenced by the fact that these pests were on the increase, and that in 1910 the state lost almost or quite two thirds of its flax crop through the work of grasshoppers, granted a small appropriation for two years' work against this insect, under the direction of the state entomologist. With these funds available, we were enabled to employ four specialists in the field during the summer, to buy spraying outfits and spraying material, and to visit and personally help individual farmers asking aid.

The mental attitude of many of these citizens toward this work is interesting. In the first place, in the winter, an apathetic condition prevails; the lesser losses are forgotten, "Hope springs eternal," etc., but in the summer, too late for efficient work, our office is deluged with mail from the same farmers who, in the late fall and winter, expressed

doubts as to the recurrence of the trouble. And then, too, we have the more or less shiftless renter who says, "No, I do not think I will do anything—hardly worth while—I move next year." We find, too, a certain class, foreigners mostly (a large portion of Minnesota farmers are Scandinavians), who feel that the state should send men to their fields at its own expense, protect their crops by the state's efforts, and, incredible as it may seem, in some instances, pay them (the farmers) a generous board bill at the same time. Then, too, many of the real estate men in a locality more or less afflicted, look with disfavor upon efforts naturally attended with some publicity, to instruct the farmers in methods of control, claiming it injures business.

The misconceptions regarding grasshoppers and locusts which prevail, and the consequent errors which creep into print, are amazing, the most common one possibly being confounding of one of the harvest flies, or so-called seventeen-year locust, with the true locust or grasshoppers. The seventeen-year locust or periodical cicada, which, by the way, is as yet lacking, or extremely rare in Minnesota, is a sucking insect and belongs to an entirely different order than that of locusts or grasshoppers. One can imagine, then, the feelings of an entomologist upon beholding the following newspaper comment, placed upon the front page with startling head-lines: "*Within the past week several farmers have seen the genuine red-legged, seventeen-year, or Rocky Mountain locust flying high in the air.*" We have used the term "grasshopper" repeatedly in this article, because it is a popular

FIG. 9. REMOVING DEAD HOPPERS FROM HOPPER-DOZER.

term for these insects, but scientifically erroneous, for the species particularly injurious, in that they are the most numerous, belong to the family *Acrididæ,* while the true grasshoppers, having long antennae, and ordinarily more or less sharply pointed heads, belong to the family *Locustidæ.* The common error of calling the periodical cicada and other species of cicada "locusts" adds to the popular confusion. Of the injurious Acridids found in Minnesota only four species are sufficiently numerous to warrant our classifying them at this time as a serious menace to crop growing, namely, the lesser migratory locust, *Melanoplus atlanis;* the two-striped locust, *Melanoplus bivitattus;* the

FIG. 10. SPRAYING FOR GRASSHOPPERS WITH ARSENITE OF SODA.

red-legged locust, *M. femur-rubrum;* the differential locust, *M. differentialis,* to which we may add, possibly, the pellucid locust, *Camnula pellucida,* and the short-winged locust, *Stenobothris curtipennis.* All of these yielded to a poison spray made by dissolving three pounds of arsenite of soda in 180 gallons of water, and adding to this solution one and one half gallons of cheap molasses. This is essentially the South African formula, though in spraying the veldt a much stronger solution was used in Africa, so strong, in fact, that vegetation was killed, a fact of little import under the conditions in the African campaign, but of the utmost importance where, as in the middle west, pastures or even grain fields have to be treated. We found that at the strength used by us no appreciable injury was evident, and although it took

from 24 to 36 hours for the insects to die after partaking of the poison, a partial paralysis was the result, and no food was taken by the afflicted animal after his poisoned meal. We applied this by means of large field sprayers, the spray covering 23 lineal feet of ground at once, though the ordinary potato sprayers could also be used. Generally speaking about fifty gallons will cover an acre, and the cost per acre, exclusive of labor, is about 30c. This figure would, of course, be influenced to a greater or less extent by the location of the water supply. A tank wagon in the field would naturally lessen waste of time in this connection. The question as to the effect of this poisoned forage upon stock naturally presents itself at this point, and we have reason to say

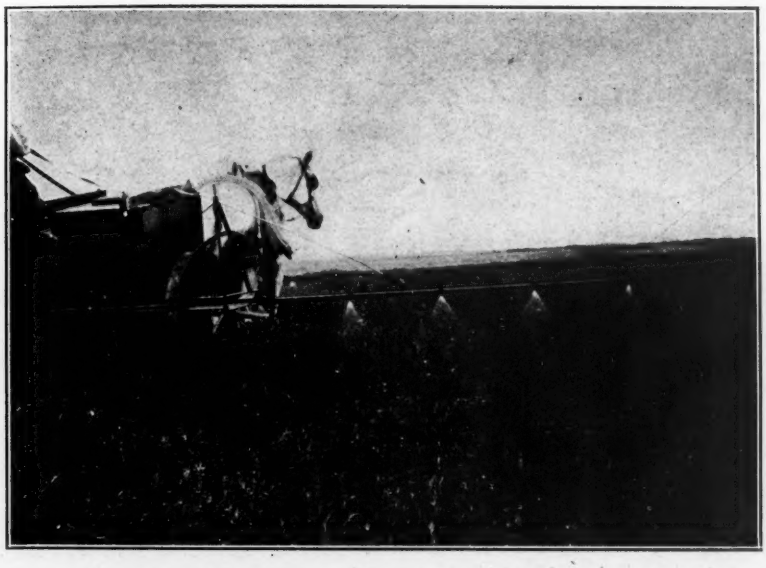

FIG. 11. ANOTHER VIEW OF OUR SPRAYING OUTFIT.

that, as used by us, there appears to be no danger from this source. Of course, unrestricted feeding upon grass drenched with a poison spray on the part of animals, forced to use such feed, and allowed no other forage, might, and probably would, have bad results, but in ordinary practice, as applied in a grasshopper campaign in North America, such conditions would not present themselves, albeit the farmer must bear in mind that he is handling an internal poison, cumulative in effect, the partaking of which in large quantities would probably mean death to any animal.

To be more explicit, the above opinion is based upon several experiments we have tried personally at the Minnesota Experiment Station, the following, and last, constituting sufficient proof to warrant the statement. A yearling heifer was placed in an enclosed plot containing

$\frac{1}{10}$ of an acre, after the grass thereon had been poisoned with the arsenate of soda spray (strength given above) at the rate of sixty gallons per acre. The animal cropped freely upon this without any ill effect. This poisoning of the grass was repeated twice thereafter, and after allowing her to remain several days in the inclosure after the third spraying, she was removed, to all appearances in even better condition than at the beginning of the experiment.

It is only from an actual test like this that one is justified in mak-

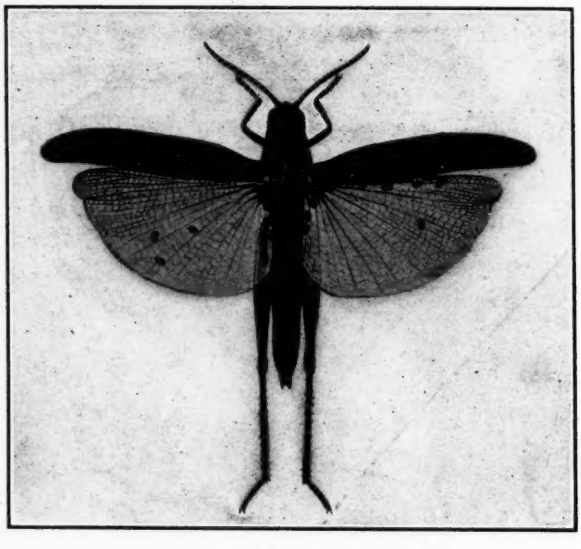

FIG. 12. MITES ON A GRASSHOPPER.

ing a statement and even in this case we qualify it by reminding the farmer that carelessness with the mixture might cause a fatal accident. Nevertheless it is evident that, properly used as directed against grasshoppers, no such severe tests as above would arise.

Many will remember a legal case in a western state where a smelting company was sued by a stock owner on the ground that the latter's pasturage was poisoned by arsenic coming from the smelters and the consequent death of the stock. The interesting point of this suit was the fact that the loss did not occur until after several months' feeding on the grass claimed to be poisoned.

An obstacle met with by the farmers in a practical application of this method is the difficulty they experience in obtaining arsenate of soda in sufficient quantity, and at reasonable cost, from the country druggist at the time when it is most needed. The most effective time to spray, and also the most economical, is shortly after the "hoppers" hatch, and long before they obtain wings, and the average farmer is not far-sighted enough to lay in a supply of the poison before hand. It is

to be hoped that this difficulty, the chief obstacle in connection with spraying, will be overcome.

While advising spraying, we do not lose sight of the older methods, more or less effective, that entomologists have been urging upon farmers in years past: the old time "hopper-dozer" with kerosene in the pan, late fall plowing, a flock of turkeys to protect the garden, etc. Our work, however, has resulted in throwing doubt upon the effectiveness of some of the generally accepted methods and has made it necessary to qualify statements made in all good faith from time immemorial. For example, the entomologist, when the farmer has declared that a large number of grasshoppers jump out of the hopper-dozer and are not killed, assuming an air of wisdom, has said, "No, if they only touch the kerosene they are bound to die, even if they appear to have escaped destruction at the time." Last summer's work has made it evident that this is only true of the short-winged forms, in which the oil can reach the spiracles; in others, where the wings cover these breathing openings and protect them as well as the body of the insect, they live to carry on the work of destruction. Again, farmers living in grasshopper-infested regions generally handle so much land that late fall plowing is impossible. As a rule, they begin to plow, in the latitude of Minnesota at least, in August, as soon as the crop is off the ground and the grasshoppers find no better place to deposit their eggs than in the plowed stubble.

Further, this advice is based largely upon the theory that if the "pocket" or capsule containing the eggs is turned upside down, or nearly so, the newly hatched hopper never gets out and perishes. It appears, however, that this view, accepted as a truth by each succeeding generation of entomologists, must be modified, for it is probable that the capsule, becoming soft and gelatinous by the action of the elements, or perhaps disappearing altogether by May, offers no obstacle to the imprisoned insect, and still further, we have no positive proof that the newly-hatched hopper can not ascend through many inches of the soil until the surface is reached. Laboratory experiments during the summer of 1912 indicate that the newly-hatched grasshopper may work his way through eight inches of fairly well packed soil.

Finally, it has been commonly believed, and is doubtless true of the majority of insects, that alternate freezing and thawing is fatal. But one of the field men exposed last winter about twenty young hoppers, hatched in the warmth of indoors, to alternately a freezing and thawing temperature several times, with no bad results to the insects, one only succumbing and that probably being injured in handling. These observations appear to leave open a large field for investigation along the lines of grasshopper control.

Grasshoppers have many enemies, but their numbers are so enor-

mous that the latter cause but little apparent depletion in their ranks. Many of our song birds eat them, as well as black-birds and crows. The sparrow-hawk's crop is filled with them in the fall, and at least one variety of tern helps the farmer materially in this direction. Skunks and other predatory mammals are partial to them, and we have personally observed the thirteen-lined gopher (*Sphermophilus tridecemlineatus*) catching and devouring them in the cool mornings of autumn. Among insect enemies, parasitic and predaceous flies are very useful in their attack upon the eggs as well as upon the hoppers themselves. Various beetles, notably some of the meloids or "Blister Beetles," insects which are themselves destructive to crops in the adult stage, make some amends for their destructiveness by preying upon the eggs.

Farmers, seeing small mites fastened to the wings and bodies of grasshoppers, have been wont to comfort themselves with the thought that these animals were reducing the number of the pests. Inasmuch as we have seen female hoppers in the fall, laden with these possible parasites, laying eggs for the next generation, having themselves completed their destructive life history, we believe too much reliance has been placed upon this phenomenon in the past and are inclined to regard their occurrence on grasshoppers as a means of dispersal of the species of mite in question, rather than a serious drain upon the vitality of the grasshopper.

It would seem, then, that the farmer must rely principally upon his own effort in this warfare, unless forsooth nature favors him by sending many cold drenching rains in May and June when the hoppers are hatching, which not only result in great mortality amongst the insects themselves, but give the crops such a stimulus that they are better enabled to withstand the inroad of these pests.

THE RELATION OF EUGENICS TO EUTHENICS

By Professor LEON J. COLE
UNIVERSITY OF WISCONSIN

NO attempt is made in the present paper to present a new array of facts nor to treat them in a novel light—even the title which has been chosen is not new, except perhaps in the arrangement of the words. But race improvement is a broad field, the cultivation of which is barely begun, and as in all cases when a new territory is to be occupied, a survey of the ground is of primary importance. Such a survey helps us in the formulation of definite plans for the systematic development of the land and saves much effort which might otherwise be misdirected. In what follows an attempt has been made to mark out some of the delimitations of our territory, the character of the soil, and consequently what crops—what lines of endeavor—may best be expected to succeed.

It is unfortunately true that a rich soil is equally suited to the growth of the grain or the weeds, the wheat or the tares. The harvest accords to the quality of the seed sown and to the diligence and intelligence applied to uprooting the undesirable plants. And just so it is with society. So long as we permit the marriage and the reproduction of the unfit in human society, we are countenancing the contamination of the seed which stands for the human crop of the next generation. The seed which we use must either be relatively free from weeds or we must put it through a winnowing process.

Every agriculturist knows the importance of continued cultivation in order to keep his land relatively free from weeds. A field allowed to go without attention or even kept down to a meadow for only a few years, soon "runs to weeds" to such an extent that the only procedure is to plow it under and put on some strong-growing crop, which will "kill out the weeds." In how far are these conditions comparable to those of our physical, moral, social and civic life? And if they are comparable, are we giving the attention we should to the winnowing of the seed? We shall also, of course, have to devote our attention to how this winnowing may best be accomplished.

Let me then be the surveyor who shall endeavor to map out our field, to determine its limits and demarkations and its relation to the neighboring fields on either side. Furthermore, let me try to chart its general physical features in an endeavor to ascertain how it may best be cultivated.

Our neighboring field on the right is that of biology—or more narrowly the field of genetics—but here we find indeed that our relationship is very close, that we possess in fact only one section of the big biological farm, and that, however big and important our corner may be, nevertheless, it is only a corner of the larger field of genetics. Our relationship is indeed here so close that we shall need no fence between us. We have, it is true, somewhat different conditions to contend with, but the same problems to solve, and by retaining our good fellowship, we may hope to receive much aid from this neighbor, whose conditions are in some ways much simpler than our own, and who can, therefore, make more rapid independent progress.

On the other side we are bordered by the field of euthenics. Unfortunately, we have not always, up to the present, been able to get along with this neighbor on the best of terms, but there is every reason why our relations should be amiable and friendly, cooperative and helpful; we both have the same objects in view—our ideals are the same, but we are not in thorough accord as to the methods by which they may best be attained.

Since the relations between the other biological sciences and eugenics are so obvious, let us examine a little more fully those between eugenics and euthenics. According to one of the foremost exponents of euthenic ideas in this country, euthenics means, "The betterment of living conditions, through conscious endeavor, for the purpose of securing efficient human beings," or "Euthenics deals with race improvement through environment," while "Eugenics deals with race improvement through heredity."[1] Galton himself defines eugenics somewhat more broadly as "The science which deals with all influences that improve and develop the inborn qualities of a race,"[2] though he must have had chiefly hereditary influences in mind, since he adds:

> The aim of eugenics is to represent each class or sect by its best specimens, causing them to contribute *more* than their proportion to their next generation; that done, to leave them to work out their common civilization in their own way.

We may conclude, therefore, that the point at issue between eugenics and euthenics is clearly that of the relative influence of heredity and environment in the development of the human race, and as such, we may proceed to discuss it further.

Whatever may have been the degree of controversy in the past and whatever may be the opinion of the practical breeder, the philosopher or the reformer, biologists are practically agreed that the environment can have no hereditary effect on organisms, at least in the crude way commonly inferred under the caption of the "inheritance of acquired

[1] "Euthenics, the Science of Controllable Environment," by Ellen H. Richards, Boston, 1910.

[2] *Nature*, Vol. 70, 1904, p. 82.

characters." Whether certain conditions are able to produce a general effect upon the germ cells of such a nature that it may cause a general modification of the resulting organisms for more than the immediately succeeding generations, may perhaps legitimately be considered still open to reasonable doubt. Such a possibility, however, does not come within the scope of our present argument and may be disregarded; and we may consider it as established to the best of our present biological knowledge that acquired characters are in no specific sense inherited.

Of course, there are euthenists who will not accept the principle I have laid down—to convince such would require an array of biological facts and experimental results which can not be presented at this time and which are not within the scope of my talk this evening, although one or two specific cases as applied to humans—cases of the failure of euthenic experiments—may be cited by way of illustration. A well-known case is that of the "Zero" family residing in Switzerland, and established by the marriage of two vicious and degenerate persons several generations back. The descendants of this pair include hundreds of offspring (of which 190 were known to be living in 1905) characterized by "vagabondage, thievery, drunkenness, mental and physical defect and immorality." But what interests us in this connection is that in 1861 a euthenic attempt was made to save many of these children. These were placed in good families, where they were free from their vicious environment; but "the attempt failed utterly, for every one of the 'Zero' children either ran away or was enticed away by his relatives." More recently a similar experiment has, according to Mudge,[3] been tried in Scotland, where pauper children from Glasgow were boarded out among the respectable and industrious natives of the western coast. Far from producing felicitous results, he has found that these children, for the most part, revert to their inborn tendencies and as a result in these formerly quiet villages a rowdy, irresponsible and even criminal element has been introduced, and "*a new slum area is being created* by the operation of the inherent slum instincts of the putatively rescued denizens of Glasgow's slums." That one of the further dangers incident to this method of caring for dependent children is coming to be realized may be inferred from a recent newspaper report that the Department of Minor Wards of the State Board of Charity of Massachusetts has decreed that none of its foundlings shall be placed in a family in which there is a minor of the opposite sex. "There would be just enough difference in the relationship between the two to make a romance the most probable thing in the world," and this is apparently conceded to be undesirable.

If we accept this conclusion you may ask, Have we not already put the euthenist to rout? Since euthenics depends upon the betterment of

[3] *Mendel Journal*, No. 2, 1911, p. 112, *et seq.*

the race by improving the environment and we know that effects of an improved environment are not inherited, how have we left the euthenist a leg to stand upon? The question seems to be one too simple to need discussion. But it is not so simple. Even granting the non-inheritance of acquired characters, the proper place of environment in a eugenic program is not a simple question. In the first place, it is very difficult to separate out those characters which are the results of inborn determinants (inherited) from those which are produced solely by reaction to environment. Or it may be, as is probably usually the case, that both influences are at work in the expression of the same character. Size may be cited as an example. Undoubtedly a child inherits the tendency to acquire a particular size; but whether it fails to reach this size or exceeds it, is in large part dependent on environmental factors which influence growth, such as food-supply, fresh air, exercise and undoubtedly many others.

But it may be, and has been, asked, granting in full the part played by heredity, is it not possible that a *permanent environment* may be created of such a nature that the outcome will be the same whatever the hereditary nature of the individual? Undoubtedly such may be true in certain restricted cases. For example, if a mosquitoless environment could be established and maintained, what would it matter whether we individually possessed or lacked a natural (inherited) susceptibility to malaria and yellow fever? It is also possible that as the skill of the surgeon and the ingenuity of the bacteriologist increase, we shall be able by means of the injection of antitoxin and the removal or replacement of organs to disregard the inheritance of many diatheses and bodily imperfections. This would require, however, the maintenance of a highly "artificial" environment, and the resulting picture is not one which appeals to us as our ideal type of mankind. It will require much further study to teach us in how far such a condition of affairs may be desirable, and only the future can show how much it may be a necessary result of the multifarious interacting forces of evolution.

Moreover, the cases of this nature must be relatively few—in the great majority, as has just been pointed out, the environment can act only when the necessary hereditary basis is present. We should predict poor success to the stockman who depended entirely upon feeding and care to produce the maximum of marketable beef, or the dairyman who by these means alone expected to compete with herds of selected animals in the production of milk.

Inherent quality is what determines the value of a gem; grinding and polishing only serve to bring out its luster and brilliance, and no amount of labor expended by the lapidary can convert a piece of quartz into a diamond. Selection of specimens which have the inherent qualities is the essential. The breeder knows this, and he realizes the im-

portance of continued selection if he would keep his stock up to standard. His motto is: "Breed only from the best." Is not selection an equally important matter in the evolution of the human race? And are we concerning ourselves sufficiently with the question of whether it is being made, and in the right direction?

There are those who claim that if unhampered the "natural" forces will make such selection and will direct evolution along the proper lines. They argue that the very defects of the pauper, the criminal, the mentally defective and otherwise degenerate classes render them relatively "unfit" for survival in the long run, so that they tend of their very nature to become extinct; and they consider as pernicious any attempt upon the part of society to better the condition of these unfortunates—for unfortunate they are, since they are not themselves responsible for having come into the world with a bad inheritance. But if we mean by "natural" forces and "natural selection" the part nature plays uninfluenced by the hand of intelligent man, why should we leave the evolution of mankind to its slow and uncertain action, when we have found it to advantage to do otherwise with our domesticated plants and animals? If the breeder has born in his herd a sickly or abnormal or otherwise undesirable animal, he does not trust to its dying of "natural" means, but his intelligence comes into play and he takes means at once to eliminate it from his breeding stock. It may, in fact, be of great service to him while it lives, as the ox, or its carcass may be of value when it is killed, as a steer; but he is careful that its blood shall not enter into the future generations of his herd. Is it not desirable, and necessary, that we should employ equal intelligence to the development of the human species that we do to our domestic animals? We shall have to utilize special methods of elimination of the undesirable, but the general problem is the same.

What has been said serves to indicate the prime importance of giving thought to the hereditary factor in human betterment rather than trusting to a blind faith in the establishment of an environmental Utopia. The fundamental error in pampering and preserving the defective and the criminal in order that he may produce more of his kind, which shall in turn increase the drag on human progress, has been pointed out so often and so well that more need not be said at this time. It may be well, however, to turn our attention for a moment to certain special social conditions and institutions in their relation to eugenics. We have in this country a number of special problems which are of the utmost importance to our civic development and well-being. One of these is the race problem; before this is solved, it will be necessary that much more study and thought shall be given to the genetic aspect of the matter. But an even greater menace, to my mind, is that of indiscriminate immigration—for such restrictions as we have on immigration at the present time are entirely inadequate. It is not

immigration of the poor peoples (in the material sense) of other nations, as such, that we need to fear. Many of our best classes of citizenship have come from this type. These are usually the ones who have been our pioneers—they did not come to America merely to find an easier life, but to obtain greater freedom and scope for development. It required a distinct effort on their part to seek new and better conditions under almost certain hardships in a new land; and this very effort marked a virility and fortitude in their make-up which is not manifest in those refugees from justice who seek our shores to escape the consequences of crimes committed or are drifted here along the lines of least resistance. What kind of philanthropist is he who, though he gives his millions to charity (well intentioned but perhaps misdirected) dilutes and contaminates the very structure of our commonwealth by importation of the scum of Europe to enable him to amass the millions? Cheaper labor may be an economic necessity, but can we afford it at the price? The danger would, perhaps, not be quite so great if there were not the possibility of the control of affairs falling ultimately into the hands of these undesirables; but after a short period every man among them is entitled to a vote, and the vote of one man has equal weight with that of another. Furthermore, the political demagogue makes it his business to see that all these votes are polled. Heredity and eugenic principles play no part here; but if suffrage is to be equal, should we not devote our attention to bettering the quality of the voter? With political control in the hands of the inferior, there will be little chance for eugenic legislation.

Of late years several nations have been viewing with alarm their rapidly diminishing birth rates. It has not been generally recognized, however, wherein the danger really lies. The fact of a decreasing population may in itself be of serious economic import; and even though the total population is being maintained or is growing on account of immigration, accession from without then means the swamping of the native stock. But immigration aside, the greatest cause for alarm is revealed upon an analysis of the statistics on the decrease in the number of children born. Such analysis shows that the decrease is not proportional for the total population, but that it is greatest among those classes of society which are the more desirable, namely, the professional classes, the artisans and the so-called middle classes generally. Statistics show that whereas in London the birth rate was higher sixty years ago among the classes just mentioned, fifty years later the conditions had become exactly reversed, and that the paupers, the defectives and the undesirable generally were reproducing at a greater rate than the other civic elements. The outcome of such a state of affairs, without the intervention of other forces, would be easy to predict. One modifying factor exists in the differential death rate, which falls most heavily on the physically and morally unfit; but here

again the statistics have shown that this factor alone is not sufficient as a corrective. Is not this a fertile field for eugenic research? And may the eugenist not hope to offer suggestions of value? It may be some time before we can hope to do much directly to stimulate the birth rate among the better classes, but is it not time steps were taken to check it among the worse?

Economic conditions must be held in considerable part responsible for the decreasing birth rate of the professional and artisan classes. The long period of preparation necessary for a profession and the average comparatively low return, the congestion and complex social relations of our cities, the employment of only unmarried and unencumbered persons in certain positions, such as that of women teachers in many of our schools, the increasing activity of women in affairs which necessitate their continued attention and often take them much from home, laws like the Employers Liability Act, which have "led to discrimination against married persons by large employers of labor with a premium thus put upon non-marriage," and even child labor legislation—these and many other factors of our complicated social conditions have had their effect on the birth rate. It is not my purpose at this time to discuss how this trend of affairs may be arrested or changed. It might perhaps even be argued that upon biological analogy, as the race becomes more specialized and its adaptations more complex, a lower birth rate, accompanied by greater care and preparation given to the offspring, may be a necessity. However this may be, it will be an impossibility if this part of the race allows itself to become swamped in the grim struggle for existence which is ruthlessly going on despite the efforts of many well-intentioned people to stop its progress.

While our survey of the eugenics field has of necessity been very incomplete, I trust I have succeeded in presenting an idea of its diversity and richness. And now let us return for a moment to consider again our relations to our euthenist neighbor. We have seen that we can not expect from the betterment of the environment alone the Utopia often figured in his prospectus. Must we then, as some maintain, abandon all efforts in that line and let "nature" take its course without euthenic interference? It seems to me rather, that with enlightened direction the two methods may work in harmony; with intelligent cooperation the two fields may be tilled for a common crop and to mutual advantage, and we may live at peace. For environment is the lodestone which distinguishes the pure metal from the dross; it is the sieve which, properly used, will enable us to winnow the chaff and the weed seed from the grain. What we as eugenists wish to make plain is that after the bad has been separated from the good they shall not be mixed together again in the sowing, for verily what ye sow, that shall ye reap.

Of course, many of the obvious defects would be apparent in any environment, but where the reaction of inheritance and environment is subtler this is not true. It is only by "feeding out" that the stockman determines which strains of his cattle most readily lay on flesh; without trying it on the track the horseman has no test of the speed of his horse; and unless the dairyman tests the milk-producing qualities of his cows under the most favorable conditions, he has no true measure for selecting those by which he may expect to improve his herd. The rose may never bloom to perfection if it is too closely crowded by other plants—our best flowers need care and protection, because they are adapted only to a special environment. It may be urged that what we need is the virile plant that will assert itself in any environment; that we need the Lincolns and others who could attain to greatness without the aid of colleges or fellowships. But we can scarcely hope to establish at once a race of Lincolns, and it is as probable that the special environments will be as necessary for the higher types of man as they are for our specialized domesticated plants and animals. It is necessary to consider its reaction to the environment the test of the individual.

When we are able to distinguish the good inheritance from the bad, how shall we proceed to perpetuate the one and to eliminate the other? This is a matter which can be worked out only with care and patience. Measures which would disturb the fundamental relationships of society form no part of the conservative eugenic program. The extent to which certain influences, such as the church and popular belief, have been able to influence marriage in the past, lead us to hope that rational education may have a considerable influence in the future. Selective mating may also play a part, since there is a tendency for a person to select a mate who has in general similar tastes and ideals. I have no statistics at hand, but I am of the impression an investigation of the subject would show, for example, a relatively high correlation between the graduates of colleges who marry college graduates. So much as to the perpetuation of the good. As to the bad, the eugenist can here lay down definite plans, and such in fact are already in operation to some extent in certain states. If society is justified in ridding itself of the criminal, it is certainly justified in taking all precautions that he shall leave no descendants.

Our eugenic program is then first of all patient and persistent accumulation and study of the facts, and in the second place education, or extension—the bringing of those facts home to the people. We must be guarded in our statements and cautious in our proposals, for to raise antagonism over misunderstandings or small disputed points will only delay and impede progress. As eugenists—and we should all be eugenists—we must work patiently, impassionately, scientifically, but keeping ever before us as our guiding star a lofty and righteous ideal.

NEGROES WHO OWNED SLAVES

By CALVIN D. WILSON
GLENDALE, O.

THE story, in its completeness, of the existence previous to the civil war, of a large number of free negro slaveholders in America has become for our generation practically a lost chapter. The fact has been almost forgotten. The full data have never been collected, and probably never will be in an exhaustive way. Much material on this subject has perished through the burning of court houses, state houses and similar depositories of documents. The generations that were familiar with this condition have gone. More than forty daily newspapers passed around from one to another during the summer of 1907 a few crumbs of information on this matter as items of curious news. Editorial comment was tinctured with surprise and in some cases with incredulity. The facts have not only their own kind of interest, but they throw light upon the economic and industrial condition of the free negroes before the emancipation proclamation.

When President Lincoln signed that paper he by the same pen reduced to comparative poverty many colored people who thus lost possession of their bondsmen. Some of these were pure blacks; some were mulattoes; while still others had in them only enough African to class them with that race, according to the social decree that a drop of African blood makes a negro, or as President Booker Washington phrases it, "makes him fall to their pile." Certain of these blacks owned from one to a dozen slaves, while others had in servitude from sixty to a hundred or two hundred men, women and children. These were to be found, at one period or another, in nearly all, if not quite all, the colonies or states where slaves were held. In some counties they were numerous, while in others they were unknown. In certain of the states this condition was at times forbidden by law, but often continued in spite of the law, tolerated or ignored; the laws upon the subject also varied from time to time. In other states, free negroes were given the privilege of being masters by special statute or this liberty was covered by general laws.

Certain of these slaveholders became such by inheritance through white relatives; others by gift; and still others by purchase after the manner of their Caucasian neighbors. In some instances they owned

members of their families, as husbands their wives and children, and in other cases the wives owned husbands and children, and again children owned their parents, in order to protect them or ultimately to set them free; the complicated legislation in regard to free negroes at various times and in various places often made it difficult for a free member of a family to manumit the others; sometimes when so liberated they had to be sent out of their state. A large number were owners of slaves without regard to relationships and held them for service and bought and sold them just as did the white people.

The negroes brought with them from their native land African ideas and customs. They were used from immemorial times to slavery. Many of those brought thence to America had been slaves in their own land. Others had been owners of slaves in Africa. In both cases they were used to slavery. It did not therefore seem to them unnatural for a negro in America to hold his brethren in bondage, when he had become free and able to buy his fellows. William Pitt, the younger, in a speech, April 2, 1792, in the British Parliament, on the abolition of the slave trade, said, "Some evidences say that the Africans are addicted to the practise of gambling; that they even sell their wives and children and ultimately themselves." The black man in America has always been imitative, and his desire to do what the white man did doubtless also influenced him in this matter. Moreover, there were in his country tribal differences and antagonisms which continued to obtain in America; the "Guinea nigger" was looked down on by members of superior tribes, and one of a higher race often felt that a Guinea negro was fit only to serve him.

Free negroes in this country began to own other blacks at a very early period in the history of slavery. As illustrating this fact, there is in the possession of the Connecticut Historical Society at Hartford, Conn., a bill of sale from Samuel Stanton, Stonington, Conn., dated October 6, 1783, to Prince, a free negro, of a slave woman named Binar; on the reverse is a bill of sale from Prince to Isaac Denison, Stonington, August 28, 1785, of the same Binar, a slave. One of the first records in the deed books of St. Augustine, Fla., is that of Joseph Sanchez, a colored carpenter, who sold to Francisco P. Sachez a negro slave for three hundred dollars. Such a servant was sold to a negro in Boston, Mass., November 28, 1724. This bill of sale from Dorcas Marshall to Scipio, free negro man and laborer of Boston, of her servant Margaret is given in full in "The New England Historical and Genealogical Register," in the eighteenth volume, on the seventy-eighth page. Early records of Mobile, Ala., reveal the same state of things in that region. Juan Batista Lusser, in 1797, was one of these negro slaveholders, as were also Julia Vilard, Simon Andry and the house of Forbes.

There is a good deal of human interest to be found in many of the experiences of these colored slaveholders and in their relations with those whom they held in bondage. Rose Petepher, of the neighborhood of New Bern, N. C., was a free colored woman who was married to a slave named Richard Gasken, who had taken the name of his master. He ran away and was in the woods for years, when his wife finally bought him to take possession when she could find him; this change of owners brought him in at once. They lived together for many years afterward, raising many children whom they hired out just as slaves were hired out. Thus they all prospered. Near the town mentioned above, on their own land, some of the grandchildren are now living and doing well.

Judge William Gasken, who owned the man of whom we have just told, was thrice married, one of his wives being a daughter of Colonel McClure, of New Bern. After his death, one of the slaves, Jacob, became the property of Mrs. Gasken. This Jacob's wife was a free woman, and they had a son Jacob, then a young man and free, of course, as the child of a free woman. Aided by his mother's efforts, he managed to purchase his father at a very reasonable price as negroes were then held. All went smoothly for awhile, when young Jacob did not act as his father thought he should and his parent reproved him with fatherly love. Young Jacob was so disgruntled that he went off to a negro speculator named John Gildersleeve, who was from Long Island and was then in New Bern. This trader bought the father at a high price and at once sent him off south. Young Jacob afterward boasted that "the old man had gone to the corn fields about New Orleans where they might learn him some manners."

There was, about 1840, in the county of Mecklenburg, Va., a family of free negroes who owned slaves. Mr. George W. Brooks, of Atlanta, recalls them when he was a youth in North Carolina in the county of Person, which lay immediately on the Virginia line. There was there quite a colony of free negroes, many of them named Epps, and supposed to be descendants of the slaves set free by Mr. Epps, the brother-in-law of Thomas Jefferson. In Person County there was a free negro named Billy Mitchell, an honest man of genial disposition, who being without means, often hired himself to work for Mr. Brook's father on his tobacco farm. Mr. Brooks remembers hearing Mitchell telling his father of his trip to Mecklenburg, about thirty miles away, when and where he went courting, and told of the lands and slaves which were owned by his girl's father. He told with much humor of an incident which occurred while he was there. He went out one morning with the girl's brother to the pig pen to look at the fattening swine. He said that one of the slave boys came and got upon the pen with them; that soon he heard the girl calling her mother to "look at Jim perched up

on the hog pen with the white folks." Billy said that he looked at them all and he could not see but Jim was about as white as any of them. Billy went back and married the girl, took up his abode with them, became interested in the estate and became a slave owner himself.

One John Carruthers Stanley, negro, was born in Craven County, N. C., in 1772. His father was a white man and his mother was an African woman purchased from a northern slave trader in the West Indies, where the woman with other negroes had been carried direct from Africa. Captain Stewart was at the time sailing one of John Wright Stanley's vessels, running between New Bern and the West Indies. In his boyhood the young negro John was apprenticed to a barber, at that time in New Bern, named John Carruthers; J. C. Stanley was generally known as "Barber Jack" toward the end of his life. He married a woman with more negro blood than he possessed, hence she was darker in color than her husband, though he was not light. In the year 1808 his mistress, Mrs. Lydea Stewart, the captain being then dead, had him emancipated by the North Carolina legislature. Then he advanced rapidly in property until he was the owner of sixty-four slaves, and at the same time there were forty-two negroes of both sexes bound to him by law for service. At that time he owned two large plantations a few miles distant from New Bern, one on Trent River called Lion Pasture, one on or near Bachelor's Creek called Hope; on these his negroes were employed. He resided in New Bern and owned houses there. But finally after so much success, he engaged in speculations and went down hill even faster than he had gone up. In the meantime he had reared sons and daughters and had educated them. Some of these children owned slaves up to the civil war, and they held them rigidly to account. Stanley died some years previous to the war. This family had necesarily to move in a circle of their own; yet now and then the women would be invited to dinner by a few of the best citizens. One of the Stanley boys, John Stewart, taught free school in a small way and occasionally clerked in a store. He held slaves, as did his sisters, who never married, up to the emancipation proclamation.

There was a colored brick mason in New Bern named Doncan Montford, who owned slaves; he was a dark mulatto. One of his slaves, Isaac Rue, was also a mason; he sold him to a lawyer, George S. Altmore. Isaac's wife was a free woman, a pure-blooded negress. They had children, who under North Carolina laws were free. One of their grandsons, Edward Richardson, was at one time postmaster of New Bern, appointed to the office by a Republican president.

There was in Columbus, Ga., a free negress named Dilsey Pope who owned a house and lot and also her husband, whom she hired out. He offended her in some way and she sold him to the late Colonel Seaborn

Jones; then she repented and tried to repurchase him, but his white owner now turned the tables by refusing to sell him.

A free negro named Charley Cobb, a carpenter by trade, lived in Montgomery, Ala. Mr. S. Q. Hale, of Birmingham, remembers this man when he was himself at home on his father's plantation on the Carter Hill road, now the property of the descendants of Colonel Arrington. Charley owned a negro named George; he was also owner of a horse. How to make George and the horse self-supporting was the problem that confronted Charley. In attempting to solve this question, Charley rented of Mr. Hale, senior, a field containing fifteen or twenty acres; the rent note was for a money consideration. About nine o'clock on the morning when George began to pitch his crop, he, jug in hand, appeared at the well in Mr. Hale's yard. Here he met one of Mr. Hale's servants, Maum Flora, and it seemed to be a case of love at first sight. Each morning and afternoon throughout the cropping season, George would appear at the well, ostensibly to quench his thirst, and on each of these occasions he and Maum would flirt for an hour or so under the big oak by the well. Meantime Charley was plying his trade in Montgomery, and when the note fell due he asked Mr. Hale, "how much money in addition to all of George's crop would satisfy the claim?" Charley the master had worked for the support of George the slave.

There was a negro named Nat Butler who lived near Aberdeen, Harford County, Md., who owned a small farm and bought and sold negroes for the southern trade. This sharp and noted fellow would persuade a slave to run off and hide for a few days at a place prepared by Butler, who would in the meantime see the master of the runaway and learn the price he would take for him. If the owner had little hope of recovering his slave and so placed the price low, Nat would buy him and resell him to slave dealers who knew Butler's rendezvous for hidden negroes. His conduct became so notorious that he lost the confidence of slave owners and respect of negroes, who several times tried to murder him.

Jim Scott, a worthy colored man of the same county, was a local preacher and an industrious servant. He bought himself, wife and children from his master, Mr. George Amos, giving his own note, endorsed by his white neighbors. He hired out his wife and larger children and himself for ten years and paid off his indebtedness. He offered his son Henry to Mr. Henry Webster of "Webster's Forest" for three hundred dollars for five years, or until he was twenty-five years of age. Another negro in the same region sold his children in order to purchase his wife and set her free.

Dick Hunter, of Laurens County, S. C., was the slave of his wife, and he finished paying for himself long after the civil war. He died

in 1902. Dick was first owned by Mr. James Hunter. The master entered into an arrangement with the boy, an intelligent youth, by which the latter was permitted to work for others for wages and reserve a part of his earnings to be applied to the purchase of his freedom, one thousand dollars being the stipulated price. Dick married a woman of color, and had paid six hundred dollars of his purchase money when his master died intestate, leaving no record of his private arrangement with the slave boy. Thereupon Dick was sold as one of the properties of the estate and was bought by a bachelor named Nugent. Meanwhile Dick's wife had died and he married another free woman of color. This woman purchased her husband from Nugent, agreeing to pay for him on the installment plan. During four or five years the installments were paid, amounting to several hundred dollars. Then the civil war broke out, and in a little while Nugent died. His estate was claimed by relatives who lived in the west, and contracts between masters and slaves for the manumission of the latter were at that time frowned upon by the law. Dick was put upon the block and sold for the second time, bringing fifteen hundred dollars. The buyer was again his wife and she was enabled to make the purchase through the generosity and compassion of a white neighbor, Mr. Clark Templeton, who provided the money. When the war ended this debt was still due Templeton's estate, and Dick did not repudiate it, though doubtless under the law he might have done so. On the other hand, he continued to work and save, and in the course of six or eight years after emancipation he paid the last dollar with interest.

Aunt Fanny Canady was a colored woman of Louisville, Ky., who bought herself and several members of her family. She also owned her husband, named Jim, a little drunken cobbler. One day Fanny went into her husband's shop with fire in her eyes and finger pointed at her husband. She said, "Jim, if you don't 'have yourself, I'm gwine sell you down river." Jim sat mute and trembling, as to send down the river meant to sell to a negro trader and to be taken to the cotton fields of the far south.

At the outbreak of the civil war there was in Norfolk, Va., an industrious negress who was a huckstress in the market and owned her husband. He was an ardent secessionist and was in full sympathy with the firing on Fort Sumter. After Norfolk was evacuated and was occupied by the federal forces, he was loud in his expression of southern views and was at one time in the chain gang because of opinions obnoxious to the military. No slave trader was ever more convinced that the negroes were made for slavery.

A colored man named Dubroca, who lived until 1906 near Mobile, Ala., had been the owner of numerous slaves. Not long before his death a white acquaintance met him on the streets and asked him how

he felt. He replied: "O, I am feeling poorly. I am getting old. They all tell me it was a good thing to free the negroes, but I wish I had my 'niggers' back once more."

There were instances in which free negroes became the purchasers and masters of transported white people, redemptioners. An example of the purchase by free negroes of two families of Germans who had not been able to pay their passage from Amsterdam to Baltimore and were sold for their passage money to a term of labor, is given in a volume issued in 1818 in Stuttgart. It contains letters written in 1817 addressed from Baltimore to the Baron von Gagern, Minister Plenipotentiary to the diet in Frankfort-on-the-Main. The Germans of Baltimore were so outraged by this action that they immediately got together a purse and bought the freedom of these immigrants. An early law of Virginia is aimed at the same thing, and forbids negroes or Indians to buy "Christian servants," but permits them to purchase those of their own "nation."

A colored man now living in Pensacola, Fla., by name John Pous, is the son of a white father and a negro mother. They owned many slaves. When the father died the family continued to own them until the civil war. John fought in the union army. Some of his slaves are with him yet—to be supported by him.

One free negro in North Carolina became the purchaser though not the owner of his family. The circumstances were touching. He was a blacksmith and had married a slave woman, by whom he had several children. His shop was on his former master's farm, where he was liked and kindly treated. But finally this man got involved in debt and all his slaves, among them the blacksmith's family, were seized by the creditors and sold to a speculator, who resold them in Mississippi. The husband went desperately to work and in a few years got together sufficient money, placed it in their first owner's hand and got him to repurchase and bring back from the terrible south the loved ones; he was content that they should remain slaves—for the temper of the neighborhood was at the time hostile to manumission—so that he need not be separated from them.

There are other sources of information on this theme than personal reminiscences, though certain of these are difficult of access. If, for instance, all of the census of the United States for 1790 were in print, doubtless a very large number of data of this kind could be obtained. The census of only three states, New Hampshire, Vermont and Maryland, has been printed. That of Maryland furnishes interesting facts concerning negro slaveholders. In the volume called "Heads of Families, First Census of the United States; 1790; State of Maryland," issued by the government in 1907, the white and black population is given by counties. The report indicates in different columns free white

males of sixteen and upward, including heads of families; free white males under sixteen; free white females who are heads of families; all other free persons; and slaves. In the lists of names, the free negroes and mulattoes are always distinguished from white persons. Therefore in studying this census it is a simple matter to ascertain the number of free negro slaveholders reported and the number of their slaves.

In this census we find that there were in Maryland in 1790 forty-eight free negro slaveholders, owning one hundred and forty-three slaves. It is probable that the number of slaves was somewhat larger, since in several instances the figures in the slave column are illegible in the original manuscripts of the census; in the printed volume these illegible figures are marked as such by a star; when a star is found in a column set apart for slaves, this must mean that there was at least one slave held by the person whose name is opposite the star; we have in such cases counted one slave. In passing, it is curious to note that in this first census we find in Charles County, Md., in 1790, one Eleanor Linkin, mulatto, had in her household three free persons and two slaves; if this Eleanor were not dated 1790, or some other early year, she would certainly have been thought one of the many namesakes of the great emancipator.

The "List of the Taxpayers of the City of Charleston, S. C., 1860," names one hundred and thirty-two colored people who paid taxes on three hundred and ninety slaves in Charleston. In this class were included eleven Indian families who had consorted with the negroes. In or near Charleston "free colored people," as they were there known, were generally of mixed blood, sometimes of Caucasian and African and sometimes of Caucasian and Indian. They obtained slaves by inheritance, by gift and by purchase. Some of these slaveholders were children of rich planters; they were not considered illegitimate or slaves, but as children and were educated and bore the name of the father. Upon the death of the father, these children would come into possession of his estate, including slaves.

There was a rich planter in Charleston named Fowler who took a woman of African descent and established her in his home. It is not recorded whether or not he married her, but be had no other family. There was a daughter born, who was called Isabella; the planter insisted that she should be known as Miss Fowler. She grew to womanhood and was married to Richard De Reef, a young man of Caucasian Indian blood. Her father gave her a wedding gift of a plantation and enough slaves to work it. At emancipation Mrs. De Reef had forty slaves liberated. In Charleston in 1846 there was a free woman of color whose father had been her master and who manumitted all of his children. She bought a slave for several hundreds of dollars; she was satisfied with her bargain and in a short time they were married.

We have found a large number of individual instances of negro slaveholders in Kentucky, Tennessee, Virginia, Maryland, both the Carolinas, Missouri, Georgia, Alabama, Florida, the District of Columbia, Delaware, Mississippi and Louisiana, but have not space for all of these in this paper. We will, however, give a few of these.

Mr. Thomas Blackwell, who lived in Vance County, N. C., owned a favorite negro named Tom, who was a fine blacksmith. He was allowed to hire his own time and was finally permitted to buy his freedom at a price far below his worth; he was a very valuable man. This was about 1820. Tom prospered and bought two or three slaves. William Chavers was a well-educated negro who bought a good deal of land in Vance County, from 1750 to 1780, and he owned a good many slaves; his descendants also for several generations were slaveholders. John Sampson, of Wilmington, was a slaveholder in 1855.

Robert Gunnell, a free-born, full-blooded African Virginian, married a slave wife, but bought her of her master before their first child was born, so becoming the legal owner of her and all her children and of their daughter's children. He, with all his family, was a resident of the District of Columbia, during the civil war, when slavery in the district was abolished. All slave owners there received compensation for each slave. Gunnell received three hundred dollars each for his wife, for each of his children and for all the living children of his daughter—eighteen in all. Except for a short time during the civil war he lived at Langley, Fairfax County, Va., and died there in 1874. Also, in the District of Columbia, Sophia Browning bought her husband's freedom for four hundred dollars, from the proceeds of her market garden, and she was in turn purchased by him. Alethia Tanner purchased her own freedom in 1818, for fourteen hundred dollars and that of her sister Laurena Cook and five children, in 1826. At the emancipation in the district, April 16, 1862, one negro received $2,168 for ten slaves; another $832 for two; another $43.80 for one, and another $547.50 for one, while from the $4,073 placed to the credit of the Sisters of the Visitation of Georgetown, $298.75 was deducted by Ignatius Tighlman toward the purchase of the freedom of his family.

Among the people with negro blood in the Indian Territory there were slaveholders. It is well known that the Five Civilized Tribes of the Indian Territory—Creeks, Cherokees, Chickasaws, Seminoles and Choctaws—had slaves both before and after establishing their new nations in the west. Among the Creeks and Seminoles the lines between masters and slaves were less rigid. There has been a good deal of intermarrying between these tribes and negroes. There three-quarter blood makes an Indian, though the other quarter is negro; in recent allotments, the United States government adopted this per cent. in determining who were freedmen and who were Indians. Three of the

tribes never recognized the right of intermarriage with the negro. The present chief or governor of the Creeks held slaves and is part negro. One official of the Creek tribe, who had sufficient negro in his family to exclude his children from the public schools of the nation under its laws and sent his children abroad to be educated, held slaves.

The most familiar aspect of this subject is that which existed in Louisiana. In "The Cotton Kingdom," by F. L. Olmsted, he says:

He said—a negro with whom the author was talking in that region—in answer to further inquiries, that there were many free negroes all about this region. Some were very rich. He pointed out to me three plantations, within twenty miles, owned by colored men. These bought black folks, he said, and had servants of their own. They were very bad masters, very hard and cruel—hadn't any feeling. "You might think, master, dat dey would be good to dar own nation; but dey is not. I will tell you de truth, massa; I know I'se got to answer; and it's a fact, dey is very bad masters, sar. I'd rather be a servant to any man in de world, dan to a brack man. If I was sold to a brack man, I'd drown myself. I would dat—I'd drown myself, dough I shouldn't like to do dat nudder; but I wouldn't be sold to a colored master for anyting."

In "A Journey in the Seaboard Slave States," by the same writer, he says:

There are also, in the vicinity, a large number of free colored planters. In going down Cane River, the *Dalmau* called at several of their plantations, to take on cotton, and the captain told me that in fifteen miles of a well-settled and cultivated country, on the bank of the river, beginning ten miles below Natchitoches, he did not know but one pure-blooded white man. The plantations appeared no way different from the generality of those of the white Creoles; and on some of them were large, handsome and comfortable houses. These free colored people are all descended from the progeny of old French or Spanish planters and their negro slaves. Such a progeny, born before Louisiana was annexed to the United States, and the descendants of it, are entitled to freedom.

An intelligent man, whom I met at Washington, who had been travelling most of the time for two years, in the planting districts of Louisiana, having business with planters, told me the free negroes of the state in general, so far as he had observed, were just equal in all respects to the white creoles. There are many opulent, intelligent and educated. The best houses and most tasteful grounds that he had visited in the state belong to a nearly full-blooded negro—a very dark man. He and his family are well educated, and though French is their habitual tongue they speak English with freedom, and one of them with much more elegance than most liberally educated whites in the south. They had a private tutor in their family.

The following paragraphs are copied from a footnote to an article on "Condition of the Free Colored People in the United States" in the *Christian Examiner* for March, 1859:

"A Wealthy Negro Family.—An immense estate in Louisiana, embracing over four thousand acres of land, with two hundred and fifty negroes belonging to the plantation was recently sold for a quarter of a million of dollars. The purchaser was a free negro, who is said to be one of the wealthiest men of the South."

The above is from a New York paper, and refers to the Harrison property, which was purchased by Cyprian Ricaud, a free man of color of our parish. If the property had contained as many acres as stated above and as many slaves, it would have brought nearer a million and a quarter than a quarter of a million. On the contrary, the land, we believe, comprised some sixteen hundred acres, and there were about one hundred slaves of all sizes. It lies in the rear of Madame C. Ricaud's plantation; and the two plantations, now owned by that family, probably do comprise the number of acres of land and slaves as above stated, making them, doubtless, the richest black family in this or any other country.[1]

We shall now attempt to make an estimate of the number of negro slaveholders throughout the period of the existence of slavery in America, and the number of slaves held by them. We shall proceed upon the basis of certain data already ascertained and set forth in this paper.

Let us take first the date 1790. In that year there were in Maryland forty-eight negro slaveholders, owning one hundred and forty-three slaves.

There were then in that state free negroes, 8,043. The ratio of negro slaveholders there and then to other free negroes in 1790 in Maryland was 1 in 167. The average of slaves per owner was 3.

There were in 1836 in New Orleans 640 slaves owned by free negroes. The average of slaves per negro owner in Maryland was, as we have shown, 3. Taking the same average as holding in New Orleans in relation to these 640 slaves, we have 213 colored slave owners in New Orleans in 1836. We may safely assume that there were as many more in the whole state of Louisiana, or 426 in all, at that date.

There were in Louisiana in 1830 (we have the census by decades, and not for the years between), free negroes, 16,710. The ratio of the 426 colored slave owners to other free negroes would be 1 in 39.

Again, in Charleston, S. C., there were in 1860 colored slave owners, 132. We may safely assume that there were as many more in the whole state of South Carolina, or 264 in all.

In 1860 there were in South Carolina free colored people, 9,914. The ratio is 1 to every 37 other free colored people in that state at that time.

There were in the slaveholding states during the whole period of slavery at least 500,000 free negroes. This can be estimated by taking the total census of free negroes, by decades, from 1790 to 1860, dividing in half to avoid counting any one twice, and dividing again in half to exclude the free states.

Taking the ratio 1 in 167 in 1790 in Maryland, and 1 in 39 in Louisiana in 1836, and 1 in 37 in South Carolina in 1860, and taking their sum and dividing by 3, we have the ratio of 1 in 80 as a slave

[1] Extract from the Plaquemine, La., *Sentinel*, 1859.

owner. Applying this ratio to the 500,000 free negroes, we have 6,200 negro slave owners.

Accepting the proportion of slaves to each owner, as found already, 3 each, we have more than 18,000 slaves held by negroes in the course of slavery in this country.

We believe this to be a very moderate estimate. We are of the opinion that these figures are much below the fact. Yet they may be suggestive as a conservative estimate on a matter concerning which no estimate has ever been made before, so far as we know.

This puzzling subject has interested me for a number of years. Several years ago, I gathered such data as I could at the time and prepared a paper on "Black Masters," which appeared in the *North American Review,* November, 1905. Later, I undertook a further search. I searched as much of the literature of slavery as was accessible to me, and this was done to a major extent with only negative results. I carried on a wide correspondence with state librarians, public librarians, historians, historical societies and a host of individuals who might probably be possessed of some of the knowledge I was seeking. I sent cards to twenty newspapers asking for correspondence on the subject. These letters in two conspicuous instances came to the notice of leading newspapers, which took up the subject and printed letters, quoted documents and brought out a good deal of illuminating information. During the summer of 1907 more than forty newspapers quoted these data or commented on them, in the main giving the few facts over again as they had appeared in the two or three papers that opened up the discussion. This was spoken of as "the new phase of slavery," and was discussed editorially in several instances. Certain editors frankly acknowledge previous ignorance of such a condition. Others lifted their eyebrows and suggested a degree of incredulity, perhaps scenting a fake. A number of journals, however, brought some grist of desired information to the mill.

The bibliography of this subject is exceedingly sparse. There is no treatise specifically on the theme, except my own paper in the *North American Review.* There is no reference to it in any encyclopedia, as far as I can learn. There are only scattered references to it in a few books and in files of newspapers. The bulk of the facts is still buried in unpublished documents in court houses, historical societies and libraries. There are probably a few hundreds of people still living who have recollections of this phase of slavery. So we are justified in calling this subject, in its completeness, a lost chapter.[2]

[2] The facts for this essay were gathered by me for Mr. A. H. Stone, representing the Carnegie Institution of Washington, and are here used by his consent.

THE ADMINISTRATIVE PERIL IN EDUCATION

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PRIVILEGES must be justified by occasion. The close of an academic service of twenty-five years is the justification; the privilege assumed is an indulgence in the use of the imperious pronoun, first person singular—a considerable liberty of expression, as it substitutes conviction for argument. In extenuation I plead that I am not speaking for myself, but, under the warrant of sympathy, for an unorganized, probably unorganizable, group, scattered geographically, exposed to varied intellectual climates, united by a community of interests, reacting similarly to common factors in experience. The only singularity is a persistent concern for my professional class—a profitless solicitude for their welfare.

Looking backward I distinguish overlapping periods of development in the higher education, of divergent tendency; nor is this a gray-haired retrospect. Things move quickly in a country where each generation undertakes to make precedents, and an imitative subserviency follows the flag of heralded success. I began my career under the impulse of a quickened interest in intellectual callings, for which at the time the Johns Hopkins University was the progressive sponsor. The spirit of the movement was the emphasis upon the personality and training of those who were and were to be intellectual leaders. I found myself in an intensely alert democracy of learning. The feeling was in the air that notable men were there doing notable work; prophets were honored in their own land, the honor often echoed from abroad. My most salient impression of President Gilman was and remains that of a man with keen joy and pride in the discovery of unusual men, in facilitating their emergence, in proclaiming their achievements. Rank counted for little and quality for much.

The ambitious colleges were changing to universities, sometimes prematurely with flourishes on paper unsupported by performance; generally with a sincerity of spirit and policy. Men of my academic generation felt themselves part of this progressive movement. They gained a foothold, and, as a rule, rapid advancement. They were called upon to occupy responsible if elastic chairs, the bright prospects offsetting the shortcomings of the moment. The Ph.D.'s of the 80's and early 90's felt themselves a welcome part of the university with whose fortunes they linked their own, were themselves contributors to its growth with a reasonable singleness of purpose and sensible community of endeavor. Quite naturally their engrossment in establishing their positions kept them away from intimate concern with general

policies and problems of management. Faculties were small and informal; the calls of committees not oppressive; problems of adjustment relatively simple; rival interests were not yet disturbing. It was not a golden age; nor is its color-scheme in memory due to the mellowing of years. There was an abundance of homelier metal; and the process of refinement was uncertain and tedious. Yet there was an orchestral harmony—a sense of being considered and of playing a part—that can not be referred to an insensibility to discord, or to a blissful ignorance of standards and possibilities.

The period of transition came with a rush and was hurried to its consummation. Everything grew, enlarged, expanded—grounds, buildings, plans, facilities, positions, students and duties—most of all students and duties, least of all salaries. Some of the maturer members of the guild felt the change as delayed growing pains. The adjustment involved difficulties and a stern disregard for hesitation, a brusque treatment of opposition. Size was truly a complication that must be fairly met. Competition without and rivalry within became conspicuous; the perspective of things changed notably. Administration became imperative. Correlation was urgently demanded and unflinchingly enforced. Standards and ideals were changing; whether for good or ill was far more uncertain. The success of measures became more momentous than the manner of securing them. Interests of an academic type were confronted with interests of a measurably different temper, and with the assertion of authority. Pressure from the outside, from legislatures in state universities, from alumni and the public in all, became differently insistent; dissensions complicated issues. The administration which under older conditions had stood between the board and the professor's security, came to carry the external pressure to the academic career. The professor was diverted by manifold cares beyond the class-room or laboratory or study; and found that his availability for the purpose of organization directly affected his influence, his value, preferment, his status. Academic peace became as obsolete as the cloister; privileges of one order were sacrificed for advantages of another that quite too commonly failed to appear.

And now I may find relief in the use of the present tense. It is of the actual situation and of the recent past that I speak, and that without reticence. This is not a testamentary nor yet an elegiac occasion, and by the same token not an apologetic one. I have indicated the conditions under which certain convictions have matured, slowly and confidently—convictions that carry a vital message of caution, of distrust. The one paramount danger, the most comprehensively unfavorable factor affecting ominously the prospects of the higher education—and the lower not less so,[1] though differently—is *the undue dominance of ad-*

[1] The danger of externalism—the theme of the present discourse—to the public school-system is looked upon by Mr. J. F. Munroe ("New Demands in

ministration: in policy, in measures, in personal relations, in all the distinctive interests of education, and the welfare of ideas and ideals. What is imperiled most directly is the academic career: its worth, its service, its security, its satisfactions, its attractiveness to the higher types of men.

The professorial career is in its requirements distinctive, though not unique; it is by nature institutionalized. The professor can not very well be unattached or very much of a free lance; yet his creative energies demand a sympathetic, unhampered environment. He can not sell his birthright and remain a freeman; the institution can not place a mortgage upon his output without injury to its value. The university can best provide the collective facilities, the communal stimulus, the larger environment, in which intellectual products flourish. Institutionalism carries a menace to personality, at the worst reducing those enlisted in its service to a set of cogs in a wheel; yet the intimate association with a corporate body offers a worthy communion if worthily administered by those free to follow the wisdom that in them lies. The corporate university can be no more and should be no less than the reflex of its spirit; to express the quality we borrow the term *esprit de corps*—the indigenous sentiment holding that corporations have no souls. Under present conditions it is a needlessly difficult task to make the inevitable institutional quality of the professorial service a source of strength; to reduce its disabilities is the first step. American professors are not disposed to call one another "Herr College"; what he professes shapes the manner of the man above the bare fact of his profession; and thus the professor loses the solidarity of interest more readily attained in other callings. His professional sense needs stimulation. The requisites of a true profession are that its members shall authoritatively represent, advance and control its interests, as well as the qualifications for membership; each member thereof shall be subject definitively to the judgment of his peers. The profession forms a peerage in the best sense. Thus weighed, the professoriate is found sadly wanting; and until this privilege is restored or acquired for the American professor, the career must continue to suffer a serious, almost a fatal handicap. Present tendencies are aggravating this unfortunate influence; the current is set strongly in the opposite direction;

Education, 1912'') as a potent factor in the comprehensively unsatisfactory character of our educational system, methods and product. He regards the limitation of the authority of school boards and the establishment of school faculties with authority over educational matters as essential steps to permanent improvement. The present system wastes the intellectual force and enthusiasm of good teachers; it deadens initiative and cultivates prudent acquiescence. In its place a true professionalism would advance the status of teaching and teachers more effectively than any other single measure, and would bring with it the benefits now sought for in vain by petition and complaint.

its drift is felt by those in the stream and by the onlooker alike, as the sweeping *dominance of administration.* That temper controls the professorial career, thwarts its development as an independent life-service. The formula of the investiture of the scholar, "with all the dignities and privileges thereunto appertaining," has come to carry a cynical flavor—the privileges often enjoyed as one is said to enjoy bad health.

The prevalent system of university control has been called "externalism." Authority rests ultimately and so far as they choose to exert it, constantly with the governing boards of trustees or regents; it rests dominantly, and by delegation from the former, with the president, intermediately at the latter's discretion with the deans. Let it be conceded that a system often yields to, but yet more constantly determines, or reflects, the spirit of its administration. But as to the nature and effect of the system, I propose to cite others; it would indeed be strange if my conviction of so public a situation should not be shared by kindred observers. To reflect the distrustful and anxious attitude of thoughtful critics, I shall present a considerable series of views touching upon all sides of the situation. I must rely upon the earnestness of expression and the cumulative appeal to carry the full force of the protest, which is necessarily weakened by detachment from the supporting context.

The contrast of the prevailing "American" system with the practise and spirit of other countries is striking. In our allegedly democratic land "university government has assumed a form that we might have expected to see in a land accustomed to kings. European universities have a constitution that might have come from some American political theorist; American universities are as though founded and fostered in the bourne of aristocracy. . . . The polity that we might call monarchic is thus not only frequent in the new-world colleges, but it is stripping away the few lorn shreds of popular control which still remain among them" (G. M. Stratton). "Elsewhere throughout the world the university is a republic of scholars, administered by them. Here it is a business corporation" (POPULAR SCIENCE MONTHLY: editorial). It is indeed a "departure from our usual American ideas as well as from the scholarly custom elsewhere, that we should have called into existence in affairs of learning a regnant body the life activities of whose members lie outside the realm they rule" (G. M. Stratton). "The American university has become an autocracy, wholly foreign in spirit and plan to our political ideals and little short of amazing to those marvels of thoroughgoing democracy, the German universities" (J. P. Munroe). "The main ends of the university are the same in all lands, but our American presidents and boards of trustees are an indigenous product which can scarcely be regarded as essential" (J. McK. Cattell). In brief it seems that in our superficial democratic zeal we react aggressively to the show of authority and the symbol of distinction,

while quite insensitive to the inner thralldom covered by specious profession. Our English exemplars accept the former naturally, gauging it at its true worth, and keenly resent any invasion of the spirit of liberty; there "the university is unconstrained in presence of its visible lord, bringing as he does, no thought of imposition, but standing forth rather as the representative and spokesman by free choice of those who are the learned guild" (G. M. Stratton). In other relations, also (witness: politics), our citizen plainness may harbor the vested interests of autocracy.

We may not be deeply concerned as to the source of this American brand of externalism, though such knowledge may temper without removing our conviction of its present unsuitableness. It has been suggested that it is a sympathetic survival of a colonial, absentee form of government—"a government that was well enough for a boy's academy in colonial times" (G. M. Stratton); also, that "the present relationship between the faculty, trustees, and president may be regarded as a haphazard growth, the result of a *laissez-faire* policy, affording an example of the same sufficient-to-the-day spirit and smug satisfaction" (Stewart Paton) that obtains in municipal management, in which in turn we acknowledge old-world superiority. The unsuitability of the system to needs and conditions, and the menace it harbors to interests of vital import remain the same, whatever the historical justification, or lack of it. Freely and fully admitting its points of merit, the most charitable verdict may still recognize it as an example of the partially good forming a serious obstacle to the better or the best. "The administration imposed on universities, colleges, and school systems is not needed by them, but simply represents an inconsiderate carrying over of methods current in commerce and politics" (J. McK. Cattell). "The development of our American universities is seriously handicapped by the present system of administration" (Stewart Paton). "No single thing has done more harm in higher education in America during the past quarter-century than the steady aggrandizement of the presidential office and the modelling of university administration upon the methods and ideals of the factory and the department store" (*Springfield Republican:* editorial). "The very idea of a university as the home of independent scholars has been obscured by the present system" (J. E. Creighton). "All experience of democracy with itself justifies the plea for more democracy in American educational administration." (*Boston Herald:* editorial). The disastrous effect of the system in blighting the academic career is set forth in no uncertain terms. "It is one of the most productive of the several causes which are working together to bring about 'the degradation of the professorial office'" (G. T. Ladd). "If the proper status of the faculties is to be restored, and if the proper standard of educational efficiency is to be regained, there must be a radical change in the

relations of the teaching and corporate boards" (J. J. Stevenson). "Unless American college teachers can be assured that they are no longer to be looked upon as mere employees paid to do the bidding of men who, however courteous or however eminent, have not the faculty's professional knowledge of the complicated problems of education, our universities will suffer increasingly from a dearth of strong men, and teaching will remain outside the pale of the really learned professions. The problem is not one of wages; for no university can become rich enough to buy the independence of any man who is really worth purchasing" (J. P. Munroe). The prevailing system "does not attract strong men to the profession of teaching, nor does it foster a vigorous intellectual life in the universities. And occasionally a gross and tyrranical abuse of authority reminds the world how far America is behind Germany in the freedom of its university life" (*Springfield Republican:* editorial).

It is quite proper that the professor should be called to account for his meek submission to the situation that is oppressively thrust upon him. "Now the idea of professionalism lies at the very core of educational endeavor, and whoever engages in intellectual work fails of his purpose in just so far as he fails to assert the inherent prerogatives of his calling. He became a hireling in fact, if not in name, when he suffers, unprotesting, the deprivation of all initiative, and contentedly plays the part of a cog in a mechanism whose motions are all controlled from without" (*Dial:* editorial). "Young men of power and ambition scorn what should be reckoned the noblest of professions, not because that profession condemns them to poverty, but because it dooms them to a sort of servitude" (J. P. Munroe). "But there is real danger that the existing system may prove repulsive to men of the highest intelligence and character and that mediocrity and time-serving may be developed where we need the most vigorous ability and independence" (POPULAR SCIENCE MONTHLY: editorial). "The degrading tenure" of the professor is spoken of as forming a "nursery of abject cowardice" (W. C. Lawton). How oppositely the protest of the professor is met when the academician summons courage enough to protest, appears in these two comments: "Truly the academic animal is a queer beast. If he can not have something at which he can growl and snarl, he will growl and snarl at nothing at all" (*Educational Review:* editorial). "At any rate American professors have come to feel that their independence is imperilled and their proper influence in the university organization seriously impaired by the activities of deans, presidents, and trustees." "Whatever organization may be necessary in a modern American university, the institution will not permanently succeed unless the faculty as a group of independent personalities practically control its operation" (J G. Schurman). And here the call to arms! "The professor must teach the nation to respect learn-

ing; he must make the nation understand the functions and the rights of the learned classes. He must do this through a willingness to speak and fight for himself" (J. J. Chapman).

The system is concentrated in the president. So often uncritically the recipient of praise as the visible embodiment of the source from whom all blessings flow, he is as naturally chosen as the one on whom all curses fall. Critically temperate statements admit the enormous powers he wields to mitigate or to aggravate the evils of the system; yet we are asked to consider that "the benevolent and efficient despot is the worst kind; the cruel and incompetent despot soon disappears" (J. McK. Cattell). The educational situation is naturally subject to the unfortunate influences of the social climate. "The individual has once more been subordinated, crudely commercial standards prevail, and control has been seized by the strong and the unscrupulous" (J. McK. Cattell). The relation between the president and the professor, though not untouched by the quality of mercy, is indeed strained, quite too commonly to the breaking-point. Its vital wrong is this: it sets forth that "we exalt administrative ability above scientific insight." Universities "should be the last to typify in their own structure the thought that discovering truth and imparting the vital principle whereby others may discover it are of a dignity less than that of organizing and management" (G. M. Stratton). This is the charge; that the president "is in large measure thought of, and thinks of himself, as the master, or the foreman, or the captain, of a body of men working under his direction; and this fact has a potent influence on the whole character and spirit of academic life in America" (*New York Evening Post:* editorial). Presidential inaugural addresses show the drift of the current: "And there is the style of ill-concealed arrogance, expressing the personality of the man who frankly thinks of his colleagues as subordinates, and who will ride rough-shod over their rights as men and their freedom as educators whenever his masterful instincts prompt him so to do" (*Dial:* editorial). The president is appointed "not to elevate the institution as an educational power, but to make of it 'a big thing.' . . . The executive duties of his office render the president less and less fitted as the years go by to represent the purely educational side of the institution, yet every year strengthens his control of all the interests. This condition is not in accord with business common-sense" (J. J. Stevenson). The universities seem to drift towards or to desire "high-priced imperious management" and "low-priced docile labor" (*Dial:* editorial)—truly a dismal combination. The censure is at times diverted to the governing board. "Our colleges have been handled by men whose ideals were as remote from scholarship as the ideals of the New York theater managers are remote from poetry. In the meanwhile the scholars have been dumb and reticent" (J. J. Chapman). And this in extenuation: "The financial gentlemen are applying in

naïve good faith, to a mechanism which they utterly fail to understand, the rules for efficiency in a bank or a department-store" (W. C. Lawton). They seem to be as unfortunate in delegating as in exercising their powers. "The present autocratic position of university executives was created for them by the acts of trustees in shifting responsibility for the performance of certain duties from their own shoulders to that of the president and deans" (Stewart Paton). The "quickest and least troublesome way to solve administrative problems is to give as free a hand as possible" to some capable man (J. P. Munroe). The ready vindication of such authority lies in that much-abused term, "efficiency." "When the wisdom of letting a man lord it over an aggregate of employees instead of conferring with a company of scholars is questioned, the answer is the efficiency with which the autocrat can get things done" (J. McK. Cattell). Efficiency undefined and unattached is either the most meaningless[2] or the most dangerous of terms; there are efficient fools and knaves and meddlers and weathervanes and apologists and dissemblers, and most hopelessly the class whose costly efficiency is an eruption of their callous insensibility. Even so directly a utilitarian thing as a signpost is efficient only when you know where you want to go and where not; the term should never be permitted to appear in educational discussions without a chaperone.

The relation of professor to president can not be dismissed at this point. On the one side is the irritating accountability or subserviency or worse. "To hold a Damascus blade over other men's lives, careers, reputations, may still be the fashion in Damascus. The Anglo-Saxon has had the right for uncounted centuries to a full hearing and decision by an open council of his peers" (W. C. Lawton). Given the right type of man, and it may be easy to avoid overbearing in manner or spirit; yet it seems fated to persist in the formal relations of the professor to the administration from which (for one thing) the professor is estranged by a foolish etiquette requiring him, lest he offend by *lèse*

[2] It is worth foot-noting that the Carnegie Foundation which is ostensibly devoted "to the Advancement of Teaching" (yet is governed by a board of college presidents with no representative of the teaching profession) sponsored a report on efficiency in academic affairs, which brought forth the following comment from a journal technically expert to judge the article: "Its whole tenor was to lay emphasis upon the destruction of the academic freedom and initiative that is necessary to the advancement of human intelligence, and to promote that kind of organization which under the guise of uniformity and system effectively suppresses progress" (*Electrical World and Engineer*). And this from a worldly source: "What efficiency experts sometimes forget is that there is a type of ability that can be found and retained better by the offer of a secure and dignified post than by the flourishing of money" (*Springfield Republican:* Editorial). An efficiency primer might well set forth as its first axiom, that it consists in adapting means to ends; its second, that different ends require different means; its third that expertness in means grows out of loyalty to ends. Beyond this, matters are too complex for those who use primers—even for the intelligent and benevolent laity of mature years.

majesté, to accept the president as his representative. The president is thus strongly tempted to run with the hare and hunt with the hounds. With the right of promotion and dismissal comes the right of life and death; to exercise it is to incur the presumption of ὕβρις—to the unspoiled Hellenic conscience the sin beyond pardon. The practical result is too familiar. "The president may assume superhuman responsibility, but he is after all human in his limitations. He may regard common-sense as agreement with him, common loyalty as subservience to him, respect for the opinion of mankind as deference to that small portion of mankind which has money to give" (THE POPULAR SCIENCE MONTHLY: editorial). Transferred from the personal to the corporate relation, the breach in educational policy is coming to be more and more between the professors fundamentally interested in the ends of education and the president and deans dominated in their educational interests by an administrative temper or habit of mind. "The millionaire and the college president are simply middle men who transmit the pressure from the average citizen to the learned classes." "The educated man has been the grain of sand in the college machine. He has an horizon of what 'ought to be,' and he could not help putting in a word and an idea in the wrong place; and so he was thrown out of education in America as he was thrown out of politics in America" (J. J. Chapman). There is at once a conflict of aims and of ideals, thus inviting, according to the type of provocation, a guerilla warfare or a civil war. The system provokes unrest, uncertainty, distrust; it removes harmony, corporate pride, professional independence. So much is clearly to be read in and between the cited lines.

Before resuming speech in the first person, it will be well to consider the rejoinder—the alleged incompetence of the faculties to play the part to which some of them aspire. "It has been said that university faculties are poor legislative bodies; if true, this would not be surprising, so long as their deliberations are confined to discussing questions such as whether they shall wear gowns at commencement, the decision being with the trustees" (J. McK. Cattell). "We appear at present to be between the Scilla of presidential autocracy and the Charybdis of faculty and trustee incompetence. The more incompetent the faculties become, the greater is the need of executive autocracy, and the greater the autocracy of the president, the more incompetent do the faculties become" (J. McK. Cattell). "But was there ever a more vicious circle of argument than that which defends the persistence in a system productive of such unfortunate results by urging that the personnel of the profession has now been brought so low that the restoration of its inherent rights would entail disastrous consequences?" (*Dial:* editorial). From this "lack of opportunity to discuss the larger problems of the university" with authority and responsibility, from this "living in cramped intellectual quarters"

(Stewart Paton) there results the helpless "looking outward for (their) succor" (W. C. Lawton) that makes for resignation not born of strength, and docility not the issue of sacrificing loyalty. No one knows better than the regular attendants at faculty meetings the hesitant, dispirited, nibbling, myopic, lame and wearisome discussions that are a trial to spirit and flesh; but the reasons therefor lie in the "vicious circle" from which they can be released by converting the prisoners into the guardians of a fortress. For any believer in that oldest and perennial source of salvation, the liberation of spirit that makes freemen of slaves, knows what marvels may be accomplished by removing barriers of intellectual restraint, whether shackles, blinders or ghettos. The redemption is through the enthusiasm born of self-assertion, with responsibility as its poise. All bodies long deprived of their constitutional rights tend to become incompetent or nihilistic or restless according to temperament. If disposed to act under a sense of personal injury, they become militant; if organized and with the prospect of control, they become insurgent; if academic, they apparently become dormant. The academic situation suffers from restriction in means and neglect of ends in a confusion of peremptory demands. Reform must be directed to the illumination of ends and means, and primarily to a fitter sense of their kinship. "Administration plays a part in most of our colleges and universities altogether disproportionate to its value. Nor is the objection to this state of things merely negative. There is positive harm of the most serious kind in that submergence of self-assertive personality on the part of the professors which inevitably goes with it" (*New York Evening Post:* editorial). Here lies another vicious circle: we have so much governing to do because we rely so much on governmental machinery and so little on self-government. Yet externalism, however unsuitable and disturbing in itself, is yet more disastrous by reason of its by-products,—the distortion of purpose, the suppression of initiative, the false competitive standards that insinuate themselves in underhand and unforeseen ways, and so little of which is enough to contaminate the whole academic life. It is the common disaster that ensues when those who should lead are subservient to their following, either by force of circumstance or feebleness of principle. In the university above all should the ideals of a sturdy and righteous government be visibly expressed. Its spirit should be progressive. "It appears that the general course of social evolution is not towards competition. In the university it would probably be adverse to the finer traits of scholarship and character, most of all when, as under our present system, the competition would be for the favor of presidents and trustees" (J. McK. Cattell). Faculty incompetence and the restrictedness of academicism—much of which is superficial rather than deep-seated—is not the excuse for but largely the *result of* externalism and of living in the depressed atmosphere which it breeds.

Yet the charge of presumption recurs. Surely the cumulative wisdom that has gone into the guidance of universities would have recognized these untoward influences, would have referred them to their source, and disposed of them, if they were so real and so ominous as this arraignment sets forth.[3] Such a view rests upon a naive faith in the insight and consistency and vertebrate intellectual integrity of able and intelligent men exposed to complex social pressure, which I can not share, and for which history furnishes uncertain warrant. The best intentioned and discriminating men are prone to worship idols or to yield to those who do; the *status quo* of the standpatter easily becomes an obstacle, if not an obsession. Reforms have ever been necessary and will ever be so, so long as new as well as ancient evils yield to an increasing insight or a more sensitive conscience. Favorable or tolerable situations may degenerate as they persist and grow out of helpful relation with the advancing forces that shape our ends. It is not vice alone but many another if lesser untoward influence that first endured or resisted is by familiarity cherished, through vested interests embraced. The personal equation enters; we defend what we have acquired, established, contributed; not "a poor thing, but mine own" but "a good thing because my own" is the attitude assumed toward one's house, or town, or club, or college or automobile. All this weakens the test of fact—the vapid argument that whatever is, is best—and divests radical scepticism of the charge of presumption. Experience requires critical interpretation before it yields its true meaning. It is a common enough situation to find that men progress in their endeavors despite the handicap of the means on which they depend. The successes achieved under the present system are in my judgment partly due to the compensations that lie in every system however unsuitable, yet more largely to the mitigations exercised under considerations foreign to its temper, more plainly to violations of its provisions,—to concessions and forbearance. These the reforms advocated would establish as constitutional rights, as constructive principles fertile in promise, inviting embodiment in practical measures. The gains, the trophies, the tributes are naturally in evidence and properly so; but what of the losses, the ships that have gone down at sea! Moreover, bookkeeping in terms of intellectual and spiritual incomes is so difficult; values of ideas are so subject to difference of appraisal by shifting standards, that university

[3] The appeal to experience is curiously partial. If the larger experience of the old world be considered, the burden of proof falls the other way. Externalism does not obtain there in the same manner or temper; presidential autocracy has not been found necessary or desirable; faculty control exists in variable yet always satisfactory measure; and the evils that flourish in American institutions are minimized. It has not been shown that our educational requirements are so wholly peculiar as to demand opposite provisions; it is fairly established that the democratic traditions of the old-world are responsible for some of the mitigations and concessions which have prevented the system of imposed authority from developing its direst possibilities.

authorities are sorely tempted to abandon the attempt and put their investments in real estate—in buildings, plants, and inventories of trade catalogues—to be pointed at with pride so long as one is blessed with an easy conscience. Yet such abandonment means the loss of the soul—an ancient but not negligible hazard. Commencement addresses may be confidently counted upon to pay adequate tribute to the gains and glories of a triumphant education, with an indulgence in fustian in inverse relation to insight. It is plain and crass folly to disregard the losses and possibilities, which however intangible are by no means unreal. The wisest men have always been influenced in their judgment by what might have been; just as the future is shaped by those capable of conceiving what may be.

Reforms return to first principles to get a fair start, and are as often called upon to retrace false steps as to project the course for the future. A university is first and foremost an educational institution ministered to by a company of scholars; it engages many and diverse activities, all contributory to its welfare. Yet no other test of value is relevant than the educational one; no sacrifice in any measure of educational to other interests can be justified; no domination or intrusion of any foreign spirit can be tolerated. These premises lead with the directness of sound logic, with the constant reward that awaits singleness of purpose, to the conclusion that the university interests must be entrusted authoritatively to those expertly conversant with their nature. The professorship must be made a position of honor and authority. The evils that now cause anxiety but corroborate the vital import of academic home-rule; they do not establish its validity; it inheres in the nature of the influence which civilization has shaped to guard the intellectual interests of the race.

It is however important to view the situation in the concrete. By way of illustration I shall survey a few significant consequences of the system, which in turn are of a nature all compact. The directive forces that determine the movement and activities of the academic life do not validly or adequately express the real intentions, demands and ideals thereof; this is the comprehensive and the woeful wrong. The rest is but a bill of particulars, the recurring item in which is that through such suppression, a usurping, distorting predominance is given to a different and an unsuitable range of influences. First is the lack of initiative,—a disqualification the more serious in a career that professes to train for leadership; along with it is the absence of an authoritative referendum. The democratic implication of the terms need not be repudiated, if safeguarded by proper qualifications. The level at which a reference to a composite expression of will is demanded in order to secure the best result—and is not this in reality the aristocratic ideal of government by the most competent?—is reached whenever the qualifications of the referees are adjusted to the issues at stake. Such aris-

tocracy—or to avoid prejudice, let us say isocracy—obtains among the judges of a bench, each presumably qualified to serve, each with like status with the others, yet exercising to the full the qualities of his personality. It is about as appropriate to subject the decisions of a faculty to review by an external board, as it is apt to be constituted, as it would be to have the decisions of the bench reviewed (or influenced, as a suspicious journalism implies is the case) by non-commissioned captains of industry. If the members of the faculty are not qualified to decide educational measures, and to do so broadly, not with a narrow professionalism but with due regard to diversified, at times conflicting, public interests, then there is something seriously wrong about their training or the manner of their election or the influences to which their judgments are exposed. If such incapacity is inherent in the academic character, the appointment of a board of guardians is defensible. Yet initiative is paramount. The more expert judgment is always needed to see *what* is wanted, to frame policies, to make platforms, to raise issues; to decide *whether* this or that is wanted may often be referred with advantage to a wider constituency. To secure a double or a multiple basis of judgment on many-sided issues is a proper function of boards of trustees, corporations and alumni. The usual statement that educational questions are decided by the faculty and financial ones by the board is absolutely specious and is not borne out by practise. There is a group of plainly financial and a group of plainly educational questions; but most questions partake of both aspects. Instead of "hedging," the fact should be frankly met. Old-world precedents—and in favored cases our own usage—abundantly show that and how this may be done. Under the prevailing system the professors neither individually nor collectively settle the important directions in which matters are to move. They await the pleasure or fear the displeasure of the president and deans; and if they move, it is too apt to be with an eye to the man higher up, just as the president is tempted to urge not what his untrammeled judgment approves but what he considers will be approved by the board. The professor does not stand face to face with determinative issues; there is not a considerable body of men thinking of the university as a whole, not a sufficiently corporate sense of their being a whole; the system does not encourage it, distinctly discourages it. The referendum is there but is not unrestricted; it is beset with implications of accountability to another, rather with an independent responsibility. The scope of questions and policies included in the referendum is curtailed. The faculty is at times entrusted with the details of a plan on the general desirability of which it has not been consulted; it receives commissions, conducts a second-table order of deliberation, which makes a sorry feast. All of which is bad for the faculty, as duly set forth; and bad for the university as is also coming to be realized.

The crux of the matter is here reached. Is there or is there not a clash of interests? Do academic needs demand distinctive provisions, distinctive in end and distinctive in means? Are there or are there not economic, political, administrative, individual interests, external sources of pressure, irrelevant or undiscriminating judgments or motives, that conflict with academic purposes? Does the current system of university government impose such restraints and force the organism to an unwholesome existence, weakening the vitality of its expressions, distorting the ends of its being? Here the case, which I have made my case, stands or falls. The statement must be limited to conviction not unsupported by argument. If I am wrong in my primary contention, my plea is vain.

In further illustration of the view that such divergence is real and disastrous, I approach the disagreeable but unavoidable part of my task. I wish it were possible always to speak of the presidency and the professorship and forget the president and the professor; for these objective fictions are really the subjects of discussion. It is also true that in large measure the office shapes the man; yet personality persists despite the difficulty of recognizing in the glorified presidential butterfly the humble professorial worm. The unwise authority and false responsibility of the presidential office invites the incumbent to attempt impossible tasks; invites him to adopt irrelevant standards; to obscure issues by looking many ways and seeing none clearly; to lose the clear-cut distinctions that regulate well-adjusted views and wholesome leadership. A despondent colleague insists that the only type of man safely to be entrusted with the prerogatives of the presidency is one whose principles would require him to decline the office. The dismal problem of salary shows the situation at its worst. (Let me assure the reader that I shall not expose the futility of the professor's financial manipulations to the kindly scorn of an affluent public; it is so magnanimously conceded that he is grievously underpaid, that there is still hope that the grief may assume a pragmatic form.) It is the chaotic adjustment, the introduction of the methods of the auction-room and the stock-market that have totally obscured the fact that there are principles at stake. What is wrong to the core is the attempt to translate academic service into dollars by an esoteric procedure which only presidents understand and will not reveal. It is possible to recognize the sublimity of Don Quixote's courage in his grotesque ventures, or of Chanticleer's confidence in his relation to the solar system, though disturbed by a humiliating mischance; but the administrative alchemy seems only ridiculous; while the waving of the magic wand of "merit" is irritating because so specious and so futile.

Principles are as clear as practise is muddy. More significant for wise adjustment is what a man is paid for, than what he is paid. Salary represents an adjustment of resources to needs, to the composite

factors of the situation viewed academically, not commercially. The folly of trying to serve two masters is as patent here as elsewhere. Those who are worried lest men of unequal merit receive like salaries reveal the commercial bent of their minds; the academic concern is rather that men of like merit may receive unequal salaries. But salaries can not be regulated on the principle that it is pleasant to receive them. Rewards of merit and Christmas stockings doubtless have their place, but in the light of the lamp of learning, they seem a bit tawdry; nor does it seem helpful to punish service that does not fulfill promise by imposing complications in settling butchers' and grocers' bills. If professors are going to scramble for incomes, they lose all claim to the partial release from the economic pressure which their prerogative claims. The whole wretched business is mismanaged and causes more needless misery than it is proper to disclose. The security of the professorship is involved; the integrity of great academic traditions is involved; the soundness and poise of the intellectual life is involved. Indeed so much is involved that the enumeration might suggest to the uncharitable that the academic nervous system finds its solar plexus in the purse. The commanding consideration is that such is not the case; and the public should be prevented from so regarding it. Salvation lies in holding fast to the plain truth that this, like all other questions, must be considered and settled as an academic one. Any system will be good—though some will be better than others—that is, framed on that principle and on no other; that holds to it steadily, come what may; that solves salary questions by preventing nine tenths of them from arising; that does not invidiously discriminate between men on a money basis; that gives a man an independent seat in an academic counsel and relegates the pay day to its proper place in the calendar. "A single university which acts in this way" [*i. e.*, makes tenure and preferment dependent on the president's ukase] "will in the end obtain a faculty consisting of a few adventurers, a few sycophants and a crowd of mediocrities"; if all universities do so, able men will not embark "on such ill-starred ships" (J. McK. Cattell). But the world is slow to banish the money-changers from the temple of learning; and, sad to confess, the custodians of the shrine have invited the disturbance of their offices by considerations of the market.[4] They

[4] It is clear that I am not reviewing the salary question, but am touching only on one phase of the principles affecting its solution. The question was discussed five years ago by an association, composed of the presidents and deans of a score of the foremost universities, which is sufficiently naive or presuming to call itself "The Association of American Universities." Only one protagonist stood out against his associates for an uncompromisingly academic adjustment. Let me record my optimism in my belief that he would not stand alone to-day. I am not in the least unaware of the many difficulties that beset the practical adjustment of salaries to condition; nor do I forget that at some stage a modus vivendi between academic and economic demands must be arranged. This does not in the least excuse the reply of a president to a plea for the

have indeed been hard pressed; whether this condones the offence let each judge. It is the common case of advancing a good end by bad means, thus sacrificing a larger benefit for an immediate gain; yet in so doing—and that is the sacrilege of it—the integrity of the end is compromised, the worship of false gods sanctioned.

The largest field of conflict between the standards and consequent views and favored policies of the academic interests and those associated with administrative measures is that of educational provisions. It is true that the divergence is more commonly partial than total; yet cumulatively it is momentous,—a chronic if not acute ailment. It is not easy to illustrate it without becoming tedious. I shall choose a phase in which the public is interested. How does it affect the student, the manner of life which he is invited to lead; the influences to which he is exposed; the curriculum to which in theory he is subjected and in practise too commonly orders by devising a mingled *à la carte* and *table d'hôte* menu not contemplated in any well-designed European or American plan of education. His very presence in college or in a particular college may be a result in which the administrative emphasis has been a cause; for there are so many of him (or her) that are in college without due warrant of present fitness and future benefit. The bidding for numbers is part of the system that operates to the disadvantage of standards; for the size (not the quality) of the share of the annual freshman crop, when reported, affects the rating in the educational Bradstreet. Prosperity is statistically measured; hence the desire for more buildings and costly ones; for more instructors, many of them occupied in work that the college should require and not provide; and more and more students who must be attracted towards the local Athenopolis and away from the rival one. Accordingly the hills are all reduced to easy grades and new democratic (not royal) roads to learning are laid out for those who do not like the old ones. Requirements are set not to what collegians should learn but to what they will; as at the circus the strip of bunting is held ostentatiously high until the horse with its fair burden is about to jump, when it is inconspicuously accommodated to the possible performance. Still more fatal is the continuance of a like spirit within the college; competition is encouraged for large classes and big departments; each professor bids for students, and students have the air of patronage when they choose the

academic adjustment: "I have never been able to manage a university" (note the language) on that plan. That statement is a confession of unfitness. It would be invidious to point out how this or that institution has admirably solved one or another phase of the problem. There is sufficient proof that a reasonable solution can be reached even under present conditions. I also offer the two-edged philosophic consolation that since salary can not possibly reflect merit, it does a man no good and no harm to receive more or less of it than do his colleagues. Perhaps this truth should be kept for home consumption; to offer it to the public may lead to complications.

wares on his counter. It is difficult to have one eye on popularity and the other on scholarship and retain a concentrated attention. A confessional questionnaire upon the motives operative in electing studies would reveal family secrets, difficult to reconcile with the lofty provisions and disinterested opportunities of the catalogue.

Involved in this rivalry, friendly in appearance, deadly in effect, is the intrusion of over-practical, quasi-professional interests, to the disparagement of discipline and cultural ideals. It is as though the course of the ship of education were determined by consulting the passengers. Advertising looms large and boosts the bigness that brings revenues and responds to administrative ambitions. The general consequence, I contend, is that the policies pursued, the measures adopted, that determine what students do at college and how they do it, and what they fail to do, neither truly nor adequately reflect the intent, the wisdom, the influence of those to whom they rightly look for guidance. Let me concede at once that some of the above trends are within limits legitimate and helpful, and again that in considerable measure they are not wholly or predominantly due to the administrative influence. None the less the administrative emphasis must be charged with a large responsibility for the excess to which the natural derogations of youth have been permitted to expand.[5] The administrators have held the balance of power; they have ruled by overruling; or by yielding where resistance was demanded. If theirs is the pride, theirs is also the shame.

There can be no doubt that college life is generally and severely criticized. The perspective of student activities seems to the casual as to the close observer sadly out of joint; and this extends to more than the fact that for news of the colleges one must turn to the prismatic sporting pages of enterprising dailies. The query whether the collegiate side-shows have not eclipsed the business carried on in the main tent, if carried further, may lead to similar revelations as to the altered spirit of the performance in the academic arena. The arraignment is long and severe: students have no intellectual interests, no application, no knowledge of essentials, no ability to apply what they assimilate; they are flabby, they dawdle, they fritter and frivol, they contemn the grind, they miseducate the studious, they seek proficiency in stunts, they drift to the soft and circumvent the hard; undertrained and overtaught, they are coddled and spoon-fed and served where they should be serving; and they get their degree for a quality of work which in an office would cost them their jobs. You may read it seriously and impressively set down in Mr. Flexner's "The American College"; you may read it no less forcibly if more indulgently recorded in Mr. Gay-

[5] Since writing these words Mr. Owen Johnston has set forth in no uncertain temper the "Shame of the Colleges" in terms of undergraduate dissipation, not as ominous in its physical extravagance as in its intellectual waste. It is the undergraduate distortion of perspective that is the source of despair, and for which the academic authorities must accept a considerable responsibility.

ley's "Idols"; you may find it undisguised in Mr. Dooley's satire, and dramatically staged in "Stover at Yale." Parents are uneasy about the value of it all when their sons are in college (parenthetically with some one's else daughters); their worldly employers question it more pragmatically when college days are over. Alumni are divided between an indulgent retrospective loyalty and the enlightenment of maturer wisdom. All this smoke points to a constantly smouldering dissatisfaction, bursting occasionally into a flame of protest. Doubtless the causes of the situation so variously complained of, like the causes of the high rate of living, are both deep and wide. Yet it seems clear that things would not have drifted so rapidly nor so far, if the machinery of the university had been made more directly responsive to the educational sentiment. It is not so much a question of conservative or liberal, of standpatter or progressive. It is a question of a proper perspective and of the power to enforce it—of foreground and background, of what shall be put first and what second and what last.

Further illustration would encroach upon complex scholastic matters. One group of issues centers about the manner in which the university ideal is to be maintained while meeting and yet resisting the public pressure, or directing it to fruitful channels; for the university should be at once responsive and responsible. The several legitimate influences bearing upon educational provisions, whether publicly or privately supported, should have avenues of expression and of enforcement. Their adjustment is a delicate matter in which the representation of opinion and the disposition of authority will be both just and wise if the several factors are given due order of precedence. It is a question requiring argument, but must here be dismissed with the conviction that the academic representation is far too slight and unauthoritative, that the evils developed and others in the making are largely due to the overshadowing of academic by administrative interests. All this is but natural. Let any one of a group of interacting factors gain a headway, and the acquired momentum accumulates about it further aggrandizement unless opposed by rival forces. This type of greatness comes both by birthright of office, is achieved by set purpose, and is thrust upon the conspicuous recipient. Add to this the natural heedlessness exemplified in a prosperous and expanding environment—so pointedly shown in the exploitation of natural resources, now checked by the movement for conservation—and it becomes clear how sound policy has been sacrificed to temporary expediency, to the desire to get things done, to the neglect of the criterion of quality that in the end makes or mars. Think of the superfluous ease with which colleges and universities have been sprinkled over the land, and the misguided zeal of local ambition, and the passion for quick returns; and how inevitably must academic interests suffer under such pressure, how inevitable that administrators should seize and hold the reign of government to the

retirement of the calmer, sober claims of sound education! So far as youth and the frontier is the excuse, it no longer obtains. We are of age; nor is it so much a matter of age as of tradition. It is the survival of an unwholesome tradition into a state of affairs in which it becomes a hindrance and not a help, that constitutes the administrative peril.

A retrospect suggests the prospect and foreshadows it. I find some difficulty in attaining the degree of despondency which the outlook demands. There are many signs of a reaction against the system; while, as I have repeatedly noted, the spirit of the academic relations has steadily improved, and will, I am confident, lead in the directions of the reforms so urgently desired. The ability, earnestness, and eagerness to cooperate, on the part of governing boards, is itself a sufficient assurance. They are becoming sensitive to their externalism, and recognize the unwisdom of snapshot judgments of momentous issues, concerning the pros and cons of which they are increasingly reluctant to accept the president's view as representative. The retrospective contrast is indeed amazing. It falls just beyond my experience to have members of the faculty addressed by a member of the board as "You men whom we hire." It is within my experience to have professors summoned inquisitorially before a committee of the board to give an account of themselves, the interview conducted by the chairman with his feet on the table, and displaying a salivary agility that needs no further description. Such reminiscences carry no sting; they are merely amusing because now so impossible. They are instructive as showing how quickly the products of a world-culture follow upon the receding frontier. It lies in the power of governing boards to restore the academic prerogative. A movement in this direction would be in accord with the tendency in public affairs to correct national weaknesses and to revise cruder codes of procedure.

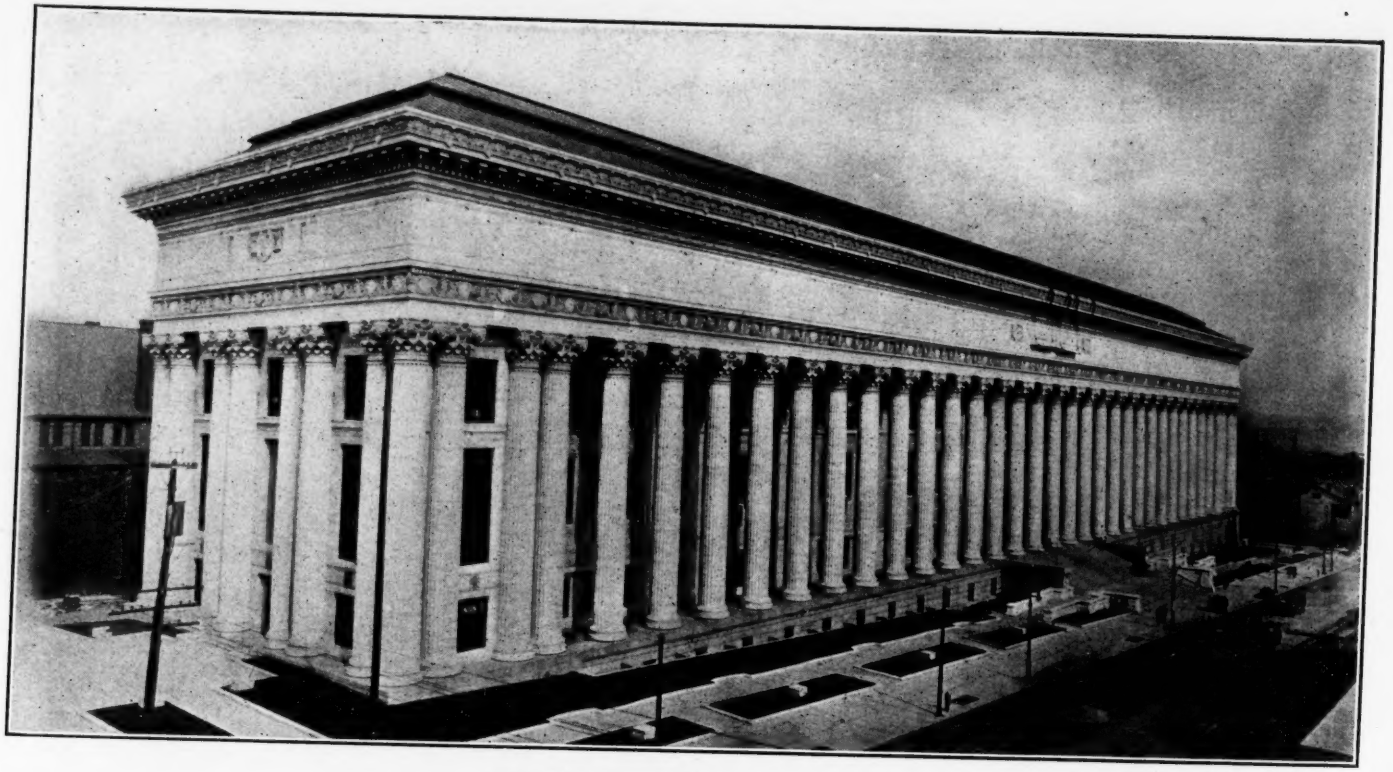
Returning some years ago from a prolonged sojourn abroad, I was on the watch for the first convincing incident that would reflect the American trait. Emerging from the attentions of the customs officials, who lost no time in showing me my place in their scheme of existence, I was accosted at the gates of liberty by a foreign urchin with the breezy offer: "Carry your bags, Boss?"—in his own land it would have been "Signor." I recognized the title as the proper address for the returning American citizen. But now the boss, political, industrial, or educational, is no longer in such high repute as to make the term an unquestioned compliment. Methods are coming to be scrutinized, policies challenged, rights and wrongs as well as successes considered, and ethical and social as well as economical balance-sheets demanded. All this makes for a refinement in the adjustment of means to ends which is sympathetic with my plea. It is natural that the men of affairs chosen for posts of honor, so many of them of the high-principled classes

responsive to the higher standards, should become sensitive to the autocracy in educational administration and look upon it with distrust. They understand, if they do not embrace, the cause of academic insurgency. They may be few in number, even exceptional; they are growing in influence. But the professor must not look passively for relief from without; he must find it within his guild. The clouds of promise though small are visible above the horizon. Protests are growing and are no longer received as dangerous or pardonable idiosyncrasies. The class of men from which presidents are recruited shows a considerable group alert to the evils of the system which they are called upon to administer. Programs of reform have been proposed: advisory bodies to offset presidential autocracy and make the position representative; the election of the president by the faculty together with the determination by the faculty of the powers which he is to exercise; the abolition of the office altogether. Speaking some years ago in a conciliatory mood, I favored the gradual elimination by reformatory measures of the most serious administrative evils, and trusted to the spirit thus awakened to carry the movement to a fitting consummation. I confess that the logic of the abolitionist position is growing upon me. It seems in so many ways disturbing to have a commanding figure in the academic horizon; the foolish and increasing pomp and circumstance of each presidential inaugural deepens the impression. Yet I still believe that the presidential office, shorn of its unwise and unsafe authority, of its aloofness in salary and lime-light conspicuousness, of the prerogatives which it has assumed because unclaimed (or, in the vernacular, because not securely nailed down), could be adjusted to accomplish all the essential desiderata. I believe this mainly because I believe that the position thus reconstructed would attract a different type of man—one who would desire to be no more and no less than an academic leader serving by the warrant of election and of constitutional support by the body which he serves. Clashes of policy must be avoided by the fusion of interests, not by the imposition of an external authority.

The rectification of the greatest loss constitutes the restoration of the greatest gain. The independence of the academic career as embodied in the status of the professor remains the *noeud vital* of the educational system. Untoward conditions affect the intellectual economy unfavorably from its lowest to its highest ramifications. The blight of the blossoms is often caused by the impoverished soil at the roots. It is at the upper levels of fruition where growth is most sensitive to climatic influences that the hazard is greatest. In acknowledging the honorary degree which Harvard University conferred upon William James to make him yet more distinctively her own, he offered in return the concentrated expression of his academic experience. "The university most worthy of rational admiration is that one in which your lonely thinker can feel himself least lonely, most positively furthered, and

most richly fed." In reminding the alumni of Harvard that "our undisciplinables are our proudest product" he gave expression to a memorable reflection. The administrative temper breeds an atmosphere peculiarly noxious to the finer, freer issues of learning. The inner quality so precious to the function of leadership in intellectual callings, dependent as they are on the delicate nurture of the creative gift, is precisely that which recedes at the first harsh touch of imposed restraint. There is a temperamental disposition involved, fraught with difficulty of adjustment under the most favorable circumstances, beset with hazard throughout its uncertain maturing at all levels. Unless the academic life is made helpful to its purpose, the course of which it must so largely be free to set for itself, the ships that bear our most valued cargoes will be storm-tossed and needlessly discouraged in their efforts to reach their sighted harbors; and some of them will mutely and ingloriously go down at sea. It is because the prevalent administrative system is so deadly to "our proudest product," that it appears to me, through the vista of a quarter century, as the supreme peril of the educational seas.[6]

[6] Since this article was written, Professor Cattell has made known the results of his inquiry in regard to the opinions of professors upon the desirability and acceptability of the present system of academic control. (See *Science*, May 24 and 31, 1912). Speaking generally the inquiry, which was conducted upon a wide basis and presumably a frank one, reveals the astonishing conclusion that 85 per cent. of the replies are unfavorable to the system in vogue—the system here criticized. It is even more significant that a large majority advocate a very decided and radical reconstruction to bring about an urgently needed reform. The variety of points of view from which the dominant system is attacked is also suggestive. Knowing as I did from the many letters of endorsement of my own utterances, that there was a wide-spread sympathy with this position, I was yet entirely unprepared to find so general an expression of dissatisfaction. It would appear that the professors constitute a fairly unanimous army of insurgents, with a peculiar reticence in announcing their cause, and a reluctance to enlist in any active operations. None the less the statistical result is a cause for congratulation; and the academic world owes a debt to Professor Cattell the nature of which the future will more clearly reveal. Of the several constructive suggestions those advanced by Professor Cattell must now be accorded the preferred position, since it is with reference to them that a representative referendum of the academic profession has been taken. When it is realized that a considerable majority favors an extensive reconstruction of the system as established, and that the professors as a body find themselves dispirited and not inspired by the provisions supposed to ensure their efficiency, it is hardly probable that boards of management will fail to respond to this convincing and notable evidence that there is something out of joint in the academic situation. In my opinion Professor Cattell has indicated a workable, flexible program. As a platform its stability will depend not so directly upon this or that plank which is inserted or omitted or trimmed to local requirements, as upon its finding a solid support in the sentiments and judgments of those whose business and privilege it will be to direct its construction, as at once a visible and a spiritual reality.

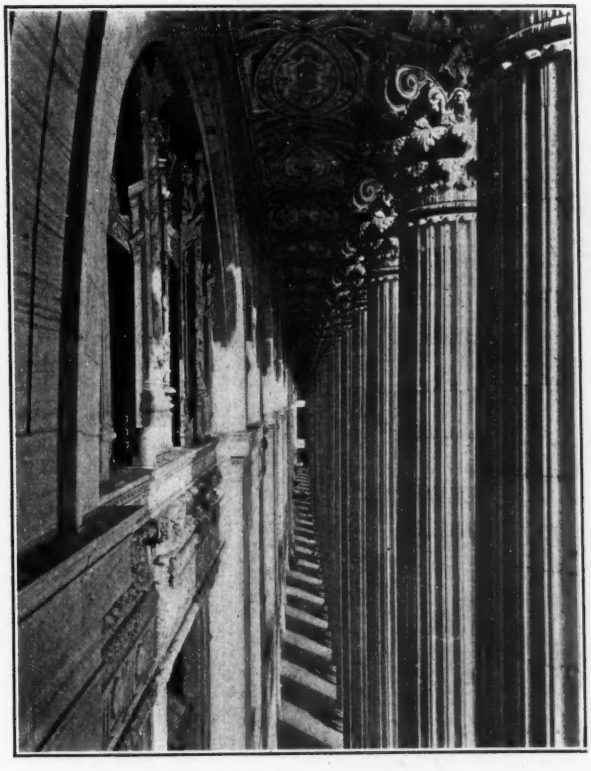


NEW YORK STATE EDUCATION BUILDING.

THE PROGRESS OF SCIENCE

THE DEDICATION OF THE NEW YORK STATE EDUCATION BUILDING

THE New York State Education Building was dedicated on October 14, with ceremonies commensurate with the magnificence of the building and the importance of the educational work of the state which it represents. The principal address was made by the commissioner of education, Dr. Andrew S. Draper, to whose efforts the building is in large measure due, and there was a program extending over three days, with a number of important addresses. These included one by Dr. William H. Maxwell, superintendent of the schools of New York, on behalf of elementary education, one by Dr. J. C. Schwab, librarian of Yale University, on behalf of the state library, one by Dr. Henry Fairfield Osborn, president of the American Museum of Natural History, on behalf of the state museum, and one by Dr. Van Hise, president of the University of Wisconsin, representing the work in educational extension for which that university has accomplished so much. Ambassador Whitelaw Reid, chancellor of the University of the

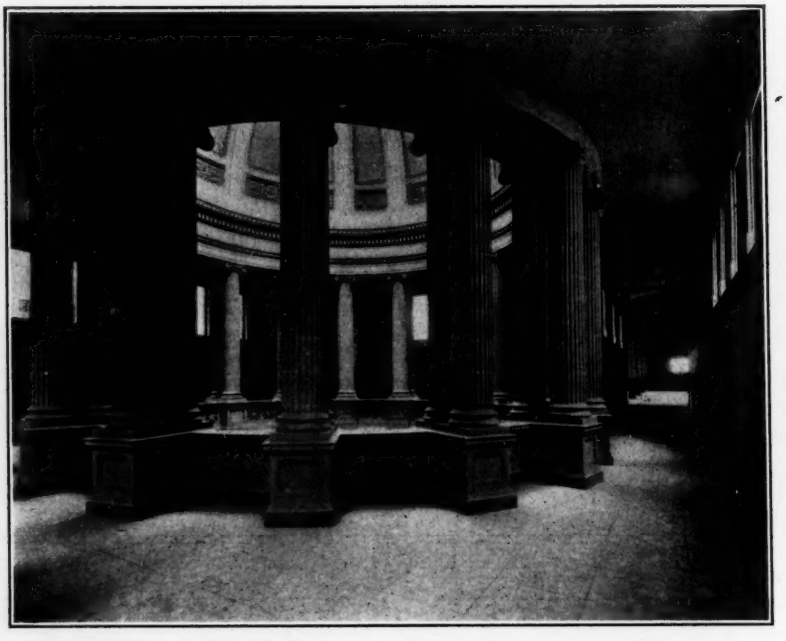


LOGGIA. BEHIND THE SOUTH COLONNADE.

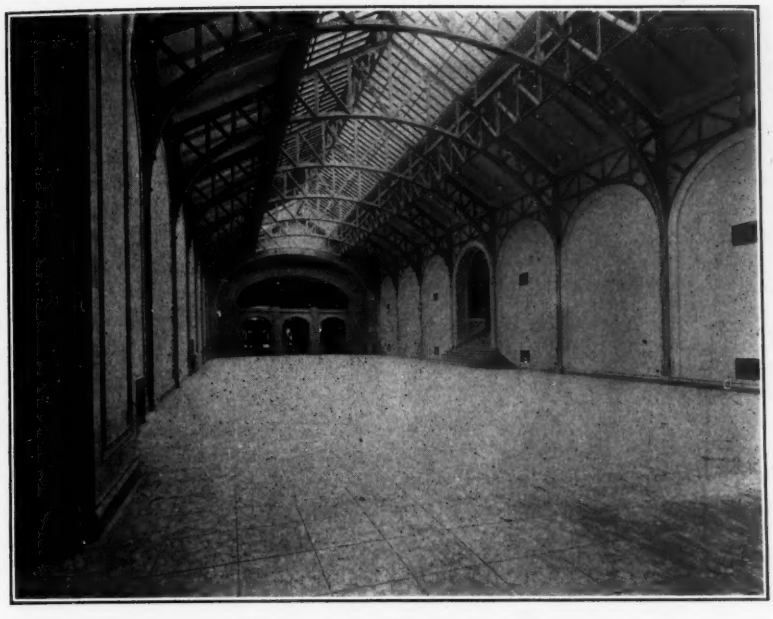
State of New York, came from England to preside and to deliver one of the addresses.

The University of the State of New York was created to supervise colleges and academies by the legislature in 1784, at its first session after the peace, and the Department of Education was created in 1812 to supervise the state system of common schools. In both respects New York led the other states and it may be all countries. The two departments were united by law in 1904, and they now have an impressive building to represent their work. The need of such a building was urged by the commissioner of education in 1905 and recommended by the regents, and in 1906 the legislature appropriated some four million dollars for the building and its site. As a result of an elaborate architectural competition, in which sixty-three designs were submitted, the plans of Messrs. Palmer and Hornbostel were accepted, and the building shown in the accompanying illustrations has now been erected.

The façade consists of a great colonnade of many Corinthian columns, behind which is a series of semi-circular openings allowing a large window area. The end façades are modifications of the front, the columnar treatment being carried across the ends. The front and end façades of the building are of white marble and terra cotta on a dark granite base. The basement contains rooms for service of all kinds, the lower part of the auditorium and the lower floors of the great book stack of the library. The first floor contains rooms for the regents and the commissioner of education with other offices, including those for the library division and state examination board. The second floor contains reading rooms opening on the stack room, with a capacity of two million volumes. The third floor contains offices and work rooms for the examination division and extension division and the library school, and the upper part of the library. The fourth floor is devoted entirely to the state museum and contains its collections in geology, mineralogy, paleon-



DOME OF THE FOYER, LOOKING INTO THE HALL OF ZOOLOGY.



PART OF THE HALL OF GEOLOGY.

tology, zoology, botany and archeology. The principal room is 570 feet in length and 50 feet in width, and is lighted from above. The offices of the director of the museum, Dr. J. W. Clarke, and his assistants are placed on a mezzanine, adjacent to the exhibition rooms.

The building should have been completed on January 1, 1911, in which case the collections of the education department and the state library would have escaped the serious injury caused by the fire which destroyed the west half of the capitol on March 29, 1911. The legislature has, however, appropriated a million and a quarter dollars to reestablish and enlarge the state library, which in size ranks fourth among the libraries of the country. The state museum has admirable collections due to the long line of distinguished men who have been connected with it. New York state spends annually about seventy-five million dollars for education, and it is becoming that it should now have a building which suitably represents the magnitude and importance of its educational work.

AGRICULTURAL PRODUCTS OF THE UNITED STATES

THE value of the farm products of the United States has been increasing year by year. If their value in 1899 is represented by 100, the increase for each of the following six years was about six points; for 1906 the increase was 10, for 1907 it was 15 and for 1909 it was 16. There was a lowering in 1910 of the rate of increase to less than two, the point then reached being 184.3, or nearly double the value twelve years before. In 1911, the decline shown in 1910 became emphasized, and the index number fell to 178.4. The total value of farm products was $277,000,000 under the total for 1910.

In the report of the secretary of agriculture, from which these figures are taken, the decline is attributed to conditions of climate, there having been a combination of hot weather and a deficiency of rainfall in the early part

of the year. The loss, however, is due to animal products and not to crops, the former having decreased over $300,000,000 in value, and the latter having gained nearly $50,000,000. The total value of farm products reached the great total of eight billion four hundred and seventeen million dollars.

Corn is the leading crop of the country, being double in value that of cotton and being three quarters the total production of the world. The amount produced last year was a little under the average for the preceding five years, but the value was greater than ever before. The United States produces about three fifths of the cotton of the world and the exports amounted last year to $585,000,000, or more than a quarter of all exports. The crop of cotton last year was the largest ever grown, but the price declined. Hay, which stands next to cotton and is close to it in value, gave last year the smallest crop produced since 1888. Wheat, worth about $600,000,000, was in quantity about five per cent. below the five-year average. Oats, fifth in order of value, decreased in quantity, but rose in price. Potatoes yielded about 90 per cent. of the average production, but the crop sold for more than ever before. Next in order of value were barley, tobacco, flaxseed, rye, sugar beets, hops, rice and buckwheat. The refined beet sugar produced in the country greatly increased, amounting to the value of $90,000,000, while cane sugar is valued at $45,000,000.

According to preliminary official reports the crops in 1912 will surpass all others in the history of this country. Eight billion dollars a year for farm products is an enormous sum. We should not, however, forget that at least one fourth of this vast amount represents the natural fertility of the soil which we are consuming. So much should surely be saved for permanent improvements, buildings, tools, stock, roads, etc., and the most profitable and permanent of all investments, the education, health and welfare of the people.

SCIENTIFIC ITEMS

WE record with regret the deaths of Dr. Lewis Boss, director of the Dudley Observatory, Albany; of Professor Morris Loeb, the distinguished chemist of New York City; of Dr. Leonard W. Williams, instructor in comparative anatomy at the Harvard Medical School, and of Professor Williston S. Hough, dean of the Teachers College and professor of philosophy at the George Washington University.

DR. ALEXIS CARREL, of the Rockefeller Institute for Medical Research, has, according to cablegrams from Stockholm, been awarded the Nobel prize in medicine. Dr. Carrel, who was born in France in 1873, has carried forward important research work in experimental pathology, physiology and surgery.—Mr. A. Wendell Jackson, who has arranged a loan of $50,000,000 to China, in opposition to the offers of the financiers of the six great powers, is a mining engineer who was formerly professor of mineralogy and economic geology at the University of California. He is a fellow of the American Association for the Advancement of Science and a fellow of the Geological Society of America.

SIR W. H. WHITE has been elected president of the British Association for the Advancement of Science for the meeting to be held next year in Birmingham.—At the eighty-fourth meeting of the German Association of Scientific Men and Physicians held recently at Münster, it was decided that next year the meeting will be held at Vienna, under the presidency of Professor H. H. Meyer.—The fourteenth meeting of the Australasian Association for the Advancement of Science will be held in Melbourne in January, 1913.—The International Congress of Mathematicians recently meeting at Cambridge adjourned to meet in Stockholm in 1916.